CUHK CSE Programming Contest 2006

17:00 – 20:00, April 21st 2006

Time Limit for the problems		
Problem A – Chain	10s	
Problem B – Word Morphing	10s	
Problem C – Plagiarism!	10s	
Problem D – Checker	10s	
Problem E – Newsboy	10s	
Problem F – Zero Hazards!	2s	

Memory Limit: 64MB

This problem set should contain six (6) problems on nine (9) numbered pages. Please inform a runner immediately if something is missing from your problem set.

Problem A: Chain

Background

"Natural selection conceived of as a struggle for life in which only those organisms best adapted to existing conditions are able to survive and reproduce."

In the virgin forest, there are 3 clusters of animals A, B, C. These animals form an interesting food cycle, A prey on B, B prey on C, C prey on A.

N animals labeled from 1 to N and each animal belongs to one of the 3 clusters. However, for each animal, we do not have enough information to determine which cluster it belongs to.

A biology student Kane, who is full of passion, decide to stay and write a report on this interesting food cycle. In the report, Kane suggests using two structure statements to describe the food cycle among these N animals.

1. "1 X Y" denoting X and Y belongs to the same cluster.

2. "2 X Y" denoting X prey on Y.

There are K statements written one by one in the report. Unfortunately, some statements are incorrect due to Kane's careless mistakes. A statement satisfies any condition below will be regarded as a false statement; otherwise, it is a true statement.

- 1. Current statement conflicts with any true statements before it
- 2. X > N, or Y > N
- 3. X prey on X

After a whole year study in the virgin forest, Kane wants you to help him figure out the false statements in his report.

Problem

Your task is to find the number of false statements by being given N (1 \leq N \leq 50,000) and K (1 \leq K \leq 100,000) statements.

Input

In the first line, there is an integer T, the number of test case in the file. The following T lines start with two integers N and K. Following K lines represent the statements in the report and each line consists of 3 integers,

1 X Y or 2 X Y

Output

For each test case, output a line containing only one integer representing the number of false statements.

Sample Input

1	Number of test case below
100 7	Explanation (Excluded in input)
1 101 1	false for X > N
212	True
223	True
233	false for X prey on X
113	false, we have 1 prey on 2 and 2 prey on 3, then 3 must prey
	on 1
231	True
155	True

Sample Output

3

Problem B: Word Morphing

Background

Cris was looking at his soup while his mother was in the kitchen. He was playing with the letters in his soup, and suddenly, he noticed that had a secret power. He could change the words morphing one word to another replacing the letter in a mysterious order.

Problem

Cris has changed the letters of some words, you have to find an algorithm that find out the morphing order from the original word to the morphed one. The rules are simple:

1.- In each step you just can change one letter from the previous word.

- 2.- A letter can be changed just once
- 3.- All the letters in the word must change.

Input

The input is a file containing several unordered morphing series. For each one you have a line with the number of words, the number of letters in each word, next line is the first word, and third line is the morphed one. The rest are the intermediate words unordered. The number of characters of each word will be larger than 1 and smaller than 1000. Words in each set will have the same size. You can assume that all the characters are letters (capital or not).

Output

For each morphing you should print all the words in the correct order to convert the first one in the morphed one

Sample Input:	Sample Output:
6 5	remar
remar	remas
pitos	remos
remas	retos
remos	ritos
retos	pitos
ritos	pato
5 4	pata
pato	pita
lisa	pisa
pata	lisa
pita	
pisa	

Problem C: Plagiarism!

Background

The Computer Science and Engineering Department currently has assigned the year two students a very difficult assignment of implementing one of the core functions of a router. You, as a very good year one student, were paid to finish the assignment! You have the money, and now you have to finish the assignment.

You are to implement the routing algorithm of a router. One of the functions of the router is to determine the best route such that a packet (a stream of data) is delivered to the target most efficiently.



Figure 1 : Example of network.

The above is an example of a network. Each node above is a router, and that each edge between the routers are the physical wire connection. To reach router 2 from router 1, the minimum cost is 1->2, which is 3. To reach router 3 from router 1, the minimum cost is 1->2->3 OR 1->4->5->3, which is also 5. This is normal, as it is reasonable that there are more than one connection in the internet given a starting location and a destination. Your assignment goal is to determine the minimum cost for a router x to reach another router y. You must also be sure your program is correct.

Input and Output

Write a program that given a collection of cities and links between them, and a routing request, prints out the minimum cost for the given routing route request.

The program takes in a number z ($1 \le z \le 100$) that determines the number of test cases followed. Each test case will be in form of the block as described

now. The next line will be two integer n ($1 \le n \le 100$) and m ($1 \le m \le 10000$) that represents the number of routers and physical wire connections in the network respectively. All physical wire connections are bidirectional. The next line will be another two integer s ($1 \le s \le n$) and t ($1 \le t \le n$) which represents the starting location and destination respectively. The following m lines each contain a set of three integer u ($1 \le u \le n$), v ($1 \le v \le n$) and w ($0 < w \le 1000$) which u and v represents the two routers being linked and w represents the cost of the link.

If there is more than one possible route, print the minimum cost. If there is no way to satisfy the request, print -1 as the answer.

You may assume input is consistent and valid.

Sample input	Sample output
2	5
57	1
123	-1
142	
451	
136	
352	
126	
235	
134	
451	

If there are two or more test cases, it will be a blank line between two consecutive, both in input and output files.

Problem D: Checker

Background

Leo is writing a new text editor and he wants to have a function of parentheses checking, but he dose not know how to do it. As a friend of Leo, write a program to help him to check the parentheses.

Problem

Your task is to write a program to check the parentheses (NOT the syntax) of the input data.

There are three types of parentheses, () {} "".

The input data is 'ok' in the following conditions,

- data A contains no parentheses;
- or {A} if data A is 'ok';
- AB if data A and B are 'ok'.

data A is a STRING variable (data between "" are viewed as STRING variable). You can assume that <u>"</u> will not appear in STRING variable

Input

The input consists of several programs. The first line contains the number of programs T (0 < T <= 100). Next follows each program.

Each line of the program has at most 1000 characters.

Each program is ended with a line containing "@@" only.

Output

For each test case, output a line "Case #I: YES" if the format of the program is ok and "Case #I: NO" if the program is not ok.

Sample Input:	Sample Output:
4	Case #1: YES
#include <stdio.h></stdio.h>	Case #2: NO
int main(){	Case #3: YES
prinťf("Hello World!!!!\n");	Case #4: YES
return 0;	
}	
@@	
#include <stdio.h></stdio.h>	
int main(){	
printf("Hello World!!!\n);	
return 0;	
}	
if (a>b){	
lif (a <b)}< td=""><td></td></b)}<>	
printt(" int main(");	
(@ @	

Problem E: Newsboy

Background

Every day, Billy rides his bicycle from office and distributes newspapers to the families on the streets. Billy can only distribute newspapers to the families on one side of a street in a single pass.

All streets are perfectly straight, and each street has two sides. Billy can turn any direction (including a U-turn) at any intersection, and can turn around at the end of any street. Billy travels at 20 km/h if he is distributing newspapers, 50 km/h when passing a visited side of street, and the time for a turn can be neglected. It is possible to reach all streets from the office. What is the minimum time that he needs to distribute newspaper on every side of every street? For each pair of streets, they have at most 1 intersection.

Input

The first line of input contains a single integer T indicating the number of test cases. Each test case starts with two integers: the x, y coordinates of the start point. The next line contains an integer N, the number of streets ($1 \le N \le 100$). The following N lines give the coordinates of the beginning and end of a street. The unit distance between each coordinate is 1 m.

Output

For each test case, your output should be the time, in hours and minutes, required to distribute newspaper on all streets and return to office. Round up to the nearest minute for each data set. Print a blank line between 2 consecutive data sets.

Sample Input	Sample Output
1 0 0 3 0 0 10000 10000 5000 -10000 5000 10000 5000 10000 10000	3:55

Problem F: Zero Hazards!

Background

In the world of network, the land is being attacked by a virus. Mario needs to rescue the world, otherwise Internet will disappeared. However, he needed to know the situation.

The world can be represented by a string of 0's and 1's. 0 represent the land is conquered by the virus, while 1 represents the land is OK. Given two indices i and j, representing the region, you are to answer number of 0's between position i and j (inclusive), so that we can use appropriate method to cure the world

Input

There are multiple cases on input. The first line of each case gives a string of 0's and 1's up to 1000000 characters long. The next line contains a positive integer n giving the number of queries for this case. The next n lines contain queries, one per line. Each query is given by two non-negative integers, i and j. For each query, you are to print the number of 0's between position i and j. Do not assume that i < j (inclusive)

The input ends with an empty string that is a line containing only the new line character, this string should not be processed. The input may also with end of file. So keep check for both.

Output

Each case on output should start with a heading as in the sample below.

Sample Input

Sample Output

Case 1: Case 2: Case 3: