Practice 2011-09-08

 +1 ironwood branch 

2011/09/08 16:30-21:30

Problem A. An Easy Problem	8 seconds
Problem B. Binary Summation	8 seconds
Problem C. Master of Spanning Tree	20 seconds
Problem D. Bounty Walker	10 seconds
Problem E. Cornerless Tiling	1 seconds
Problem F. New Year Nuisance	20 seconds
Problem G. P for Palindrome	1 seconds
Problem H. Interval Coloring	5 seconds
Problem I. Get Baron	5 seconds
Problem J. Mount. Devsda	2 seconds
Problem K. Subway	1 seconds

Note: Thanks m(_ _)m for the problemset template. m(_ _)m

(Almost blank page.)

A. An Easy Problem

Given the equation:

$$a^b = c \mod d$$

but one of a, b, c, d is unknown. Can you find the maximum solution of the unknown number?

Input

First line contains an integer T ($T \leq 123$) indicating the number of test cases.

In the following T lines, each line contains four numbers a, b, c, d, exactly one of them will be "?".

If a is "?", then $0 \leq b \leq 10^9$, $0 \leq c < d \leq 10^9$, d is a prime, $\gcd(b, d-1) \leq 100000$, solution should satisfy $0 \leq a < d$.

If b is "?", then $0 \leq a, c < d \leq 10^9$, d is a prime, solution should satisfy $0 \leq b \leq 10^9$.

If c is "?", then $0 \leq a < d \leq 10^9$, $0 \leq b \leq 10^9$, solution should satisfy $0 \leq c < d$.

If d is "?", then $0 \leq a < 10^9$, $0 \leq b \leq 1000$, $0 \leq c \leq 10^9$, solution should satisfy $d > c$.

In all case, a and b can't be both 0. (i.e. 0^0 is undefined)

Output

Output the maximum solution of the unknown number in the specified range.

If there's no solution in the specified range, output "no solution."

If there's a solution but no maximum solution, output "infinity."

Sample Input

```
5
? 2 4 31
2 ? 1 7
4 5 ? 23
3 6 215 ?
? 2 5 7
```

Sample Output

```
29
999999999
12
514
no solution.
```

(Almost blank page.)

B. Binary Summation

We know that summing the binary numbers from 1 to 2^k can be done in $O(2^k)$. But now Dreamoon want to do something special. He has a binary string S and he is interesting in the summation of all the substrings of S. In this problem, we consider each binary substring as a binary integer.

For example, if the original binary string is 1010, then all substrings are 1, 0, 1, 0, 10, 01, 10, 101, 010, 1010. The summation of those strings are 11000.

Now, give you a binary string S. Please help Dreamoon find out the summation of all substrings of S.

Input

First line contains an integer T ($T \leq 53$) indicating the number of test cases.

Each test case contains a binary string S. The length of S is no more than 10^6.

Output

Output the sum of all substrings as binary number without leading zero.

Sample Input

```
1
1010
```

Sample Output

```
11000
```

(Almost empty page.)

C. Master of Spanning Tree

"Ha!! I've just learnt Prim's and Kruskal's algorithms for finding the minimum spanning tree! That was just so awesome!!"

Kelvin stepped into the classroom door. The joy of learning algorithm glimmer on his face.

"I am the master of spanning tree now!! No spanning tree on this world can escape my wrath!!!"

However right after the presumptuous words, Professor Karn stepped into the classroom too, with a smirk on his face.

"You do not possibly think that learning Prim's and Kruskal's MST algorithm makes you an expert? Do you? Well actually it seems that you do. So now I am going to tell you that, only those who possess the power to process and calculate Minimum Spanning Tree as the graph itself changes dynamically is entitled to be 'Master of Spanning Tree' (a.k.a. MST). If you are trully the master of spanning tree, prove it to me!!"

Of course the cowardy Kelvin gives up immediately, but you wouldn't give in that easily, would you? Let's formally define the problem:

Given a graph G with weighted, undirected edges, a minimum spanning tree (MST) is a subset of edges in G that together connects all nodes, and the sum of them is minimum among all possible subsets. Now finding the MST is easy, but there are a total of Q "edge revision" operations. Each operation changes the weight of an edge in G. Please output after every operation, what is the current MST's weight right after that edge revision operation?

Input

First line contains an integer T ($T \leq 53$) indicating the number of test cases.

Each test case starts with a line containing three integers V, E, Q ($0 < V, Q \leq 30000, 0 < E \leq 60000$), indicating the number of vertex and edge of the origin graph, and Q is the number of edge revision operation.

Following E lines, each line contains 3 integers x, y, d ($x \neq y, 0 < d < 10000$), indicating an edge from x to y which has length d.

Following Q lines, each line contains 3 integers x, y, d ($x \neq y, 0 < d < 10000$), representing an edge revision operation, meaning the edge cost between x and y is changed to length d. In case the edge between x and y does not exist by the time of the operation, consider the edge added.

Vertex are numbered from $0, \cdots, V-1$. It is guaranteed that the origin graph is connected.

Output

After every edge revision operation, print the weight of MST.

Sample Input

```
1
6 6 3
0 1 6
1 2 1
1 5 1
0 3 2
0 4 5
2 5 2
4 5 4
2 3 3
0 1 7
```

Sample Output

```
13
11
11
```

D. Bounty Walker

A war has just ended between the empire Puyo and alliance Feva. As the loyal and skilled knight of Puyo, DarkKnight had been awarded for his bravery.

The king summoned DarkKnight one day to his palace, and walked him out to the balcony. Overlooking at his realm, the king pointed to a fertile field, abundant with treasures.

"This will be the reward for your allegiance. Everything you can see from here is your reward. Just make a round trip from a point on the field then back to where you started; anything enclosed in your tour is then your property."

DarkKnight is not a greedy person, though. He is however very lazy. So instead of making the largest round trips and enclosing all the lands and treasures, DarkKngiht decided to maximize his "gain/walk ratio".

That is, he'd start at some point on the field, make a round trip of total length L, enclosing K treasures. What DarkKnight wanted to do is to maximize the value of K/L.

So, given the field as a grid: some of the field is obstacle, while some are treasures. What is the best "gain/walk ratio" DarkKnight could get?

ex: In the figure below, if `$` represents treasure, `#` represents obstacle, then `*` is one possible round trip DarkKnight can go.

```
..******...
.#*###$*...
.**#$#.*...
.*###..*#$.
.****$$*...
.$#.****...
```

Note in the figure above, DarkKnight must walk IN the grid (NOT along the gridline). He is also NOT allowed to step over a grid with treasure. Also his trip must not intersect itselfs, nor consists of overlapping trails, otherwise the king might become confused and outrageous, and DarkKnight could be in serious trouble!

Input

First line contains an integer T ($T \leq 101$) indicating the number of test cases.

Each test case starts with a line containing 2 integers n, m ($1 \leq n, m \leq 30$), indicating the height and width of the field.

In the following n lines, each line contains m character, '`.`' indicates empty space, '`$`' indicates a treasure, '`#`' indicates a obstacle. Input will not contains other characters.

Output

Output the maximum gain/walk ratio in irreducible fraction.

If no round trip is possible (note that staying at the same point without moving is not considered a valid trip), the answer should be zero.

Sample Input

```
2
3 3
...
.$.
...
3 3
#.$
.#.
$.$
```

Sample Output

```
1/8
0/1
```

E. Cornerless Tiling

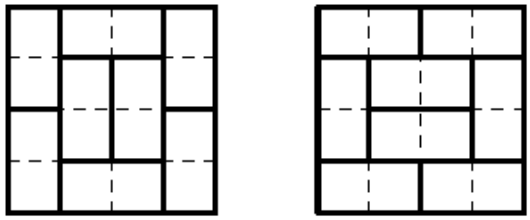
Pipi is decorating his bedroom wall with 1×2 tiles.

His bedroom wall is of size $M \times N$, and he must put 1×2 tiles on the wall without overlapping, and filling the wall completely.

Only problem is, Pipi finds it very inelegant, if four tiles shares a same corner at some place on the wall, and he would never endure such arrangement of tiles.

Given M and N, how many ways are there for Pipi to tile his wall?

For example, here are the two possible tilings of 4×4 wall:



Input

First line contains an integer T ($T \leq 514$) indicating the number of test cases.

Each test case contains two integers N, M ($1 \leq N, M \leq 1000$)

Output

Output the number of ways Pipi can tile his wall.

Sample Input

```
1
4 4
```

Sample Output

```
2
```

(Almost empty page.)

F. New Year Nuisance

Darn, it's New Year again!

Shik likes the festival a lot. Everything from the lively firecracker to endless feast with family. With one exception though. Shik has a large family, and they all live in different places. The problem comes when they need to visit a relative somewhere, but the "New Year Carpooling" rule is imposed.

During New Year, to ease the congesting traffic, the government states that a vehicle must carry at least some specific amount of people to be allowed on the highway. So for example if the carpool limit is 4 for a segment of highway, a vehicle with less than 4 people could not go into the highway.

As mentioned above, Shik has a lot of relatives to visit, so the carpooling rule becomes very bothering as somtimes it makes visiting relatives difficult or even impossible. Because of the restrictions he might even need to bring other friends along just to get on the highways!

Given the map description as a graph, where nodes are cities (possibly with Shik's relatives) and edges are roads. Also a number is associated with every edges, which is the carpooling lower limit.

Shik has a total of Q visits (v_i, u_i) to make, each starting from v_i and ending at u_i. For each query, help Shik find out what is the minimum number of passenger that must go along so the trip is possible?

Input

First line contains an integer T ($T \leq 10$) indicating the number of test cases.

Each test case starts with two integers N, M ($1 \leq N \leq 100,000, 1 \leq M \leq 200,000$), being the number of nodes and edges in the graph. Then comes M tuples of integer (v, u, c), indicating there is a bidirectional road between v and u, with carpool lower limit c ($1 \leq c \leq 10^8$). Nodes are numbered starting from 0.

After the description of the map comes an integer Q ($0 \leq Q \leq 100,000$), being the number of queries, and then Q lines of pairs of integers (v, u) ($v \neq u$).

Note that there is possibly multiple edges between a pair of nodes.

Output

For each query, output the minimum number of passenger that must travel along to go from v to u. If there exists no route between a queried pair v and u, just output -1.

Sample Input

```
1
5 8
0 1 3
1 2 1
2 3 4
3 0 1
0 4 5
1 4 9
2 4 2
3 4 6
3
1 2
1 4
3 0
```

Sample Output

```
4
9
5
```

G. P for Palindrome

There are all kinds of superheroes.

Superman, Spiderman, Batman, ... etc.

But have you heard of the Palindrome Man?

Certainly not. Since one would love to shoot webs, soar around in the sky, beat Joker up to death... but the superpower of the Palindrome Man is not really fascinating - if it can in fact be called a superpower.

Anyway, as the name indicates, the Palindrome Man can shoot palindromes around! Today he is reading magazine and found life really boring (Not so unexpected if all you can do is shoot palindromes!), so he decided to do something interesting as pastime.

The Palindrome Man selects a string S, then he shoots palindromes to cover the string. By "covering" it means that the shooted palindrome must match with the segment of words it covers, letter by letter. Furthermore, palindromes can cover each other. See example for more information.

Given S, find out what is the minimum number of palindromes the P-man must shoot in order to cover the whole string.

Input

First line contains an integer T ($T \leq 32$) indicating the number of test cases.

Each test case contains a string S ($1 \leq |S| \leq 10^6$).

Output

Output the minimum number of palindromes the P-man must shoot.

Sample Input

```
1
aabcbaabbcbbaxx
```

Sample Output

```
3
```

(Almost empty page.)

H. Interval Coloring

Today* is Hallogameboy's birthday!

He received lots of intervals as gift, and he decided to color all these intervals with some colors.

He called a coloring "good" if there exist no three intervals a, b, c of the same color such that $a \cap b$, $b \cap c$ are both not empty, but $a \cap c$ is empty.

Moreover he found that for every two intervals a, b, there is at least one point that is in a but not in b.

Hallogameboy is wondering how many colors he need for a good coloring, can you help him solve this problem?

Input

First line contains an integer T ($T \leq 530$) indicating the number of test cases.

After that for every test case, first line contains an integer n ($n \leq 50000$), indicating the number of intervals.

The following n lines contain a interval description each. Each interval is described by two integers s_i, e_i which are the start and end points of it ($-10^9 \leq s_i, e_i \leq 10^9, s_i \leq e_i$). A square bracket stands for including of the corresponding endpoint, while a round bracket stands for excluding. No interval is empty.

Output

Output the minimum color Hallogameboy needs for a good coloring.

Sample Input

```
2
2
[1,2)
(3,4]
3
[1,3]
[2,6]
(5,7)
```

Sample Output

```
1
2
```

* well, not today, but three days later.

(Almost empty page.)

I. Get Baron

Sean is playing League of legends now (yes, right now behind you). He and his teammate are trying to stole Baron. However, the enemies' supporter use Clairvoyance and notice it. The enemies are coming to stop them. The leader, Sean, has to decide if they should retreat or fight.

Sean has to evaluate the risk of fighting. If someone is surrounded by enemies, then he is in a very dangerous situation. Especially when those enemies can form a group which can do great teamworks. Give you the positions of Sean's teammates, positions of enemies and the threatening groups. Find how many times that each of Sean's teammate is surrounded by some group. Each group can be represented as a simple polygon. A player is surroundsed by the groups if and only if he is inside the polygon formed by the group.

Input

First line contains an integer T ($T \leq 19$) indicating the number of test cases.

For each test cases, first lines contains three integers N, M, G ($1 \leq N, M, G \leq 1000$).

The next N lines contain the coordinate (X_i, Y_i) of each Sean's teammate. The next M lines contain the coordinate of enemies.

In the rest G lines, each line contains a group description. Each line is start with a integer $3 \leq P \leq M$ indicates the number of enemies of the group. Followed by P integers which are the index of the enemies in this group. The index is start from 1. The enemies in one group forms a simple polygon. In each test cases, no two vertices will have same coordinate and no number will exceed 10^9.

Output

For each test cases output a line. For each Sean's teammate, output the number of enemy group surrounding him, which separate by a blank. A person is considered to be surrounded by a enemy group if he is inside the polygon or on the side.

Sample Input

```
2
3 4 2
3 3
6 2
5 6
1 3
4 1
8 4
7 8
3 1 2 4
3 3 1 2
3 4 1
1 3
1 1
0 1
0 0
0 2
2 2
2 0
4 1 2 3 4
```

Sample Output

```
2 0 1
0 1 1
```

(Almost empty page.)

J. Mount. Devsda

In the midst of Kingdom Ais'epsei lies the great Mountain Devsda. The mountain is elevated from plain ground thousands of years ago by a series of orogeny activities (Earth activities that forms mountains).

One day, Skyly the geologist was gazing at the ridge of Mount. Devsda far away, and he couldn't help wondering what was the events that brought about this great mountain.

Imagine that initially, thousand years ago, the place where Mount. Devsda now lies is a completely flat plain. The plain is long and could be viewed as a long straight line. Then there were a series of orogeny events, each of the event could be described by the tuple (L, R, D), meaning that the event elevated the mountaing ridge of Mount. Devsda in the interval $[L, R]$ by a height difference of D ($D > 0$). After all these orogeny events, Mount. Devsda's appearance now is finally formed.

Looking in awe at the skyline of Mount. Devsda, Skyly asked himself, at least how many orogeny events must have happened for Mount. Devsda to form?

Let's describe Mount. Devsda's appearance by a series of N discrete unit intervals lying on a line. As shown in the figure below. Note that there is no cliff in Mount. Devsda, so the height of each adjacent intervals, and also the height between the first/last interval and the plain (height 0) will not differ by more than 3.

Given the description of Mount. Devsda, please help Skyly find out at least how many orogeny events must have happened?

Input

First line contains an integer T ($T \leq 101$) indicating the number of test cases.

Each testcase starts with an integer N ($N \leq 100$), being the number of intervals. Then follows N non-negative integers, each adjacent ones differ by no more than 3, indicating the height of each interval. The first and last integer is no more than 3.

Output

For each set of testcase, output a single integer being the minimum possible number of orogeny events that happened to form Mount. Devsda.

Sample Input

```
3
3 1 2 1
4 1 1 1 1
4 2 3 2 1
```

Sample Output

```
2
1
3
```

(Almost empty page.)

K. Subway

On a far away island, there's a place named ACM city, governed by Mayor PJ.

One day, PJ is tired of walking to his office everyday, so he decided to build some subways in the city.

ACM city is divided into $n \times m$ squares. Every subway pass through some continuous squares. But due to technical constraints, there must be no turns in one subway. Some of the squares have hard rocks underground so subways can not pass through these squares.

Building one subway cost R dollars, and for every square (i, j), if there's no subway passing through that square, the resident there will be angry and PJ have to pay them Aij dollars. What is the minimum cost PJ have to spend?

Input

First line contains an integer T ($T \leq 100$) indicating the number of test cases.

Each test case starts with four integer n, m, q, R ($1 \leq n, m \leq 50, 0 \leq q \leq 50, 1 \leq R \leq 10000$), indicating the height and width of ACM city, and the numbers of square that has hard rocks underground.

n lines followed, the i-th line contains m numbers A_{ij} ($0 \leq A_{ij} \leq 10000$).

q lines followed, each line contains two numbers x, y ($0 \leq x < n, 0 \leq y < m$), indicating that there's hard rocks underground at (x, y).

Output

Output the minimum cost PJ has to spend.

Sample Input

```
1
3 3 1 15
21 31 7
3 5 18
4 24 4
1 1
```

Sample Output

```
53
```

(Almost empty page.)