The 2014 ACM ASIA Region Programming Contest

Gwalior Site

Onsite Contest Problems

Sponsored by IBM

Hosted by IIT Kanpur

21st December 2014

12 Problems

ACM Asia Regional (Kanpur Site) Programming Contest
December 21, 2014

Instructions

There are **twelve (12)** problems to be completed in **five hours**. Standard Input **(stdin)** and Standard Output **(stdout)** are to be used as input and output for each problem. If you test your program using PC^2, it will automatically redirect input from the sample input file to your program. **The output of your program must correspond exactly to the provided sample output format**, including (mis)spelling and spacing. Multiple spaces will not be used in any of the judges output, except where explicitly stated. A copy of the problem set will be available at **/users/acm/sw/problems.pdf**, during the contest. Sample input and the corresponding output files for respective problems can be seen in the directories **/users/acm/sw/inputs** and **/users/acm/sw/outputs** respectively.

PC^2 software will be used to judge your solutions to the given problems. Once you have submitted the solution, it will reach the judges. The time it takes for your problem to be judged will depend, among other things, on how busy the judges are. Once your submission has been judged, you will receive a message from PC^2. In case your program is judged to be correct, you will get a message "Accepted". Otherwise you will get a message indicating the problem with your program. For example, the message may be "Wrong Answer", "Compilation Error", "Runtime Error", "Time Limit Exceeded" etc.

When submitting a program via PC^2, you are required to specify a primary source file and other source files (please see PC^2 documentation for details), if you are writing your programs in C or C++, please make sure that you have only one source file. Do not have multiple source files. If you are writing your programs in Java, please make sure that the name of the file containing the main class is the same as the name of the main class with a .JAVA suffix. Again, use only one source file for your program.

You can use any of the standard library functions that your chosen programming language provides. In addition, you can use the math library in C/C++. You cannot use any other library that requires an extra flag to be passed to the compiler. If you do this, the judges will probably find a code "compilation error" in your program. Your program is not permitted to invoke any external programs. For example, you cannot use in C the system call ("grep xyz abc") to determine whether the file abc contains an occurrence of the string xyz. Violation of this rule may lead to disqualification from the contest.

Programming style is not considered in this contest. Documentation is not required. The judges will only test whether the input-output behavior of your program is correct. With the statement of each problem a *Time Limit* has been specified. If your program takes more than the *Time Limit* specified to execute on some input, it will be assumed to have gone into an infinite loop and will be judged incorrect. A problem is considered as correctly solved when it is accepted by the judges. The judges are solely responsible for accepting or rejecting the submitted programs. The regional contest director and the judges are empowered to adjust for or adjudicate unforeseen events and conditions. Their decisions are final.

Teams are ranked according to the most problems solved. Teams who solve the same number of problems are ranked by least total time consumed. The total time consumed is the sum of the time consumed for each problem solved. The time consumed for a solved problem is the time elapsed from the beginning of the contest to the submission of the first accepted program plus 20 penalty minutes for every rejected program for that problem regardless of the submission time. There is no time consumed for a problem that is not solved.

Each team may bring Team Reference Document containing up to 25 pages of reference materials, single-sided, letter or A4 size, with pages numbered in the upper right-hand corner and your university name and team name printed in the upper left-hand corner. Text and illustrations must be 12 font size Times New Roman and readable by a person with correctable eyesight without magnification from a distance of 1/2 meter. It may include hand-written comments and corrections on top of the pages only. No team is allowed to discuss/talk with other teams by any means whatsoever, during the contest period. Any such attempt, if detected, may lead to immediate disqualification of all the teams involved.

Problem A
King's test to his sons

The King of France has turned old. He would like one of his three sons to take up his place as the next King. But he doesn't want them to fight over the throne after his death. Over so many years in the past, his sons have been fighting with each other over trifles. But he feels that deep inside their hearts, the three brothers love each other. The King believes that he can bring back the love and harmony among his sons which was present in their childhood. He has asked Leonardo to help him accompolish this task so that his sons cherish their relationship again. So, Leonardo has come up with a game that will force all three of them to play together.

The factory, just on the boundary of the kingdom, produces special kind of gold chips. Each gold chip is inscribed with a lowercase letter of the English alphabet, called its *nameLetter*. There is also a unique integer called *aurumNumber* associated with each gold chip which is inscribed on the other side of the gold chip. These chips also have special grooves on their ends which can be used to attach gold chips one after the other and make a long solid linear chain out of them.

On Leonardo's advice the King has decided to call all his 3 sons for a small collective exercise. Leonardo has made three chains A, B and C containing the same number of gold chips. The gold chips in each of these chains are arranged in the increasing order of their *aurumNumbers*. Leonardo gives a chain to each of the sons. The task given to the sons is that each of them has to create a chain, for which he may remove some of the gold chips from his chain. It is necessary that all the three new chains thus created must have the same *nameLetters* when read from left to right. All the removed gold chips will be donated for charity. Each new gold chain must also have the gold chips arranged in the increasing order of their *aurumNumber*. If the sons succeed in doing this, they get to keep the gold chain with themselves. They must donate the entire chain with all of the gold chips for charity if they fail to create such chains.

All of the three sons are very greedy and therefore they want to remove the minimum number of gold chips from their respective gold chains. You have to find out that what is the minimum number of total gold chips that the three sons have to donate in order to complete this exercise successfully.

Input:
The first line of the input contains an integer T which is the number of test cases to follow. Starting from the next line, each test case consists of three strings A, B and C in separate lines. Each of these strings is the sequence of *nameLetters* in the order of the gold chips (which are arranged in the increasing order of their *aurumNumber*) in the gold chain.

Output:
For each of the test cases, print the minimum number of total gold chips which the three sons will have to donate for charity.

Constraints:
$1 \leq T \leq 13$
$1 \leq |A|, |B|, |C| \leq 450$
$|A| = |B| = |C|$
Here, $|A|$ denotes the length of a string A. Similarly $|B|$ for B and $|C|$ for C.

Time Limit: 120 secs

Sample Input:

```
2
acmicpc
acmicpd
acdicpc
aab
aba
abb
```

Sample Output:

```
6
3
```

Explanation:
Case 1: The gold chips donated by the first son are 'm' and 'c'. The second son donates 'm' and 'd' and the third son donates 'd' and 'c'. This leaves "acicp" as the *nameLetters* on the gold chains they create.
Case 2: The gold chips donated by the sons are 'a', 'a' and 'b', respectively. This leaves each of them with "ab".

Problem B
Accommodating tribal clans

The capital city of the kingdom of France has a lot of tribal clans living in the outskirts. Farming and hunting are the two major occupations of these people. These clans keep moving around the kingdom and make their homes using wood and leaves. Each clan has a different culture and in general people of one clan do not like people from the other clans. They live separately and have intra-clan weddings only.

With the advent of the new season, there are floods coming in from the Seine River. As these people don't have proper houses to live in, they have requested the King to provide shelter in the well protected capital city. The King has decided to construct temporary houses for these clans in the Great Royal Circle which is a circle in shape. As these clans do not like each other, they can't live together and would need some kind of a boundary to separate their shelters.

The King has come up with a plan to do so. He decided that a number of bamboo sticks will be placed on the boundary of the Great Royal Circle. Then for every pair of bamboo sticks a wired fence will be used to connect them and create partitions of the circle. The bamboo sticks will be placed such that no three fences cross at the same point within the circle. Proper joints are placed at locations where two fences cross each other. In this way, the Great Royal Circle is divided into a number of regions each of which will be given to a clan to live in temporarily.

As there is a shortage of dry bamboo sticks, the King's soldiers could only manage N bamboo sticks to be placed on the boundary of the Great Royal Circle. What is the maximum number of different clans the King can provide shelter to?

Input:
The first line of the input contains an integer T which is the number of test cases. Next follow T lines each containing an integer N, the number of bamboo sticks available.

Output:
For each test case, output in a separate line the maximum number of clans which can be provided shelter from the floods. Since this number can be very big, output it modulo 1000000007.

Constraints:
$1 \leq T \leq 30000$
$1 \leq N \leq 10^9$

Time Limit: 1 sec

Sample Input:

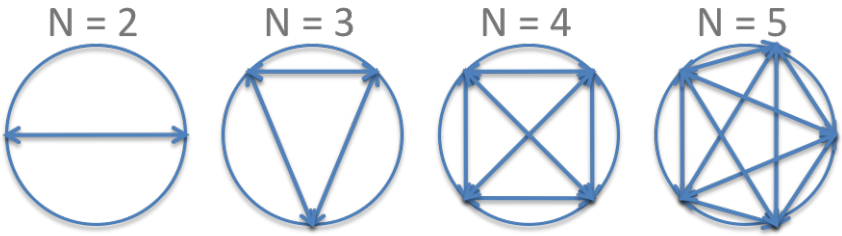
```
4
2
3
4
5
```

Sample Output:

```
2
4
8
16
```

Explanation:

The below image explains the sample input output for different values of N. The lines in the circles represent the fences and the arrowheads represent represent the banboo sticks.



Problem C
Securing Florence

The King of Florence is captured by traitors. The treasures of Florence need immediate protection. Before his surrender the King had entrusted Da Vinci with the task to hide the treasures safely. The army of Florence also came forward to help Da Vinci in this task. They have informed Da Vinci that the whole army of Florence is divided into N troops, each troop guarding a patch of land within the boundary of Florence. Since, disturbances are common during the time of war, it is quite possible that a land under a troop's protection overlaps with those under other troops. The amount of security of a location (any point on the grid) is defined as the number of troops guarding it. With this information, Da Vinci has decided that he will hide the treasures in a location which is guarded by the maximum number of troops, thus providing the treasure the maximum possible security. Can you help Da Vinci find the most secure location?

For this problem, the land of Florence can be assumed to be a rectangular grid. Each troop guards a rectangular portion of the grid with the bottom left corner as (x_1, y_1) and the top right corner as (x_2, y_2). Each rectangle has all its sides parallel to the axes of the grid. Find the maximum security possible in the land of Florence, given the information of troops.

Input:
First line of the input consists of T, the number of test cases to follow.
Each test case begins with a line containing an integer N. Each of the next N lines gives 4 space separated integers x_1, y_1, x_2, y_2 representing a rectangle with (x_1, y_1) and (x_2, y_2) as the bottom left and the top right corners, respectively.

Output:
Print T lines, each containing the maximum security achievable in the grid for each test case.

Constraints:
$1 \leq T \leq 10$
$1 \leq N \leq 10^4$
$x_1 \leq x_2$
$y_1 \leq y_2$
$-10^8 \leq x_1, x_2, y_1, y_2 \leq 10^8$

Time Limits: 2 secs

Sample Input:

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

Sample Output:

```
4
```

Explanation:
In the given sample input, the point $(4, 3)$ lies in all the rectangles except the first one. Hence, it lies in 4 different rectangles thus having a security amount of 4 which is the maximum among all grid points.

Problem D
Save the kids

Leonardo Da Vinci has entered a fort which has N catacombs numbered from 1 to N. A catacomb is an underground cemetery consisting of a subterranean gallery. His aim is to destroy each of the N catacombs, as quickly as possible.

The catacombs have a special structure. The catacombs are built in layers, with exactly one catacomb (numbered 1) in the topmost layer (layer number 1). If a catacomb is in the i^{th} layer, it will have exactly one passage to one of the catacombs in the $(i-1)^{th}$ layer. Also, from each catacomb, there is exactly one way out, which is to keep going to the above layers till you reach the top layer. In graph theory terms, the catacombs structure is a tree rooted at vertex number 1.

Just before he was going to destroy the catacombs, his apprentice sent him a few messages with the information of the catacombs that have kids in them. Each message contains the number of the catacomb that has a kid inside it. Leonardo must not destroy any catacomb that would lead to a kid being trapped inside the fort. Leonardo has to find out how many catacombs he can destroy without trapping a kid inside.

Input:
First line contains a single integer T, denoting the number of testcases.
Each testcase starts with a single integer N, denoting the number of catacombs.
Each of the next $N-1$ lines contains 2 numbers A and B indicating that there is a passage between catacomb number A and B.
Next line contains M, the number of messages Leonardo got from his apprentice, followed by M lines each containing an integer indicating the number of the catacomb that has a kid inside it.

Output:
For each message, print the number of catacombs that Leonardo can destroy without trapping any of the kids mentioned so far in the messages.

Constraints:
$1 \leq T \leq 10$
$1 \leq N, M \leq 50000$
$1 \leq A, B \leq N$

Time Limits: 3 secs

Sample Input:

```
1
2
1 2
2
2
1
```

Sample Output:

```
0
0
```

Explanation

The above system of catacombs have catacomb number 1 in layer 1 and catacomb number 2 in layer 2.

First message says that there is an kid in catacomb 2. Hence none of the catacombs can be destroyed (else the kid gets trapped).

In the second message, another kid is reported in catacomb 1. Still, none of the catacombs can be destroyed. Hence answer after each message is 0.

Problem E
Picking Da Vinci's successor

Da Vinci is about to retire from the post of Prime Minister of the French King in a month. It is going to be very difficult for the King to find his replacement. The King is worried about the junior ministers as to how they will work without a leader.

To instill in some values of team work among them, the King has asked all the N junior ministers to paint M walls together. The King feels that such a hands-on activity is a very good way to make the junior ministers come together and work as a team. The ministers are allowed to divide a wall into parts such that each part is painted by a different minister. No two ministers are allowed to paint the same wall at the same time.

It can be assumed that all the ministers paint the wall at the same rate. As this is just a training exercise, ministers may have other important jobs as well and they may not be free all the time to do the painting work. S is the start time and E is the end time between which a minister is free to paint the walls. Also, we know that for a minister, painting is a mundane job. It may happen that a minister gets bored while painting a wall, leaves it in between and starts painting another wall without wasting any time. The minister may later come back to finish the previous wall or he may ask one of the other ministers who he is friends with to finish painting the wall.

The King is really worried about the future of the kingdom which is going to have these ministers without a leader. He really wants these ministers to make smart decisions and perform well in any situation that they may face. Thus, he has decided to put some extra constraints on the wall painting exercise. The King knows the number of man hours H required for a wall to get painted completely. So, for each wall he has decided a duration with the start time A and the end time D during which the ministers should start and finish painting the wall.

As anxious the King is about testing his ministers, he is also worried that a failure in completing the task may harm their confidence. He wants to know whether his junior ministers would be able to finish the given task and meet the deadlines or not. You need to help the King to find this out.

Input:
The first line of the input contains an integer T which is the number of test cases to follow. The first line of each test case consists of two space separated integers N and M. Each of the next N lines contains two space separated integers S and E. Next M lines contain three space separated integers A, D and H each.

Output:
For each test case, output a separate line containing "YES" (quotes for clarity) if it is possible for the junior ministers to paint each of the walls during the designated time. Output "NO" (quotes for clarity) if it is not possible to do so.

Constraints:
$1 \leq T \leq 510$
$1 \leq N, M \leq 100$

$0 \leq S, E, A, D, H \leq 10^7$

Time Limits: 2 secs

Sample Input:

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

Sample Output:

```
YES
```

Explanation

The first minister paints the first wall from time $1-2$. Then he paints the second wall from time $2-3$. Then he paints the first wall again from time $3-5$. The second minister paints the second wall from time $3-4$. Thus both the walls get painted fully.

Problem F
Connecting Army Troops

The kingdom of France is about to be at war with one of its neighbouring kingdoms. Both these kingdoms share a long border along which the French army has set up a number of posts. Each post has an army posted on it to protect the kingdom from the enemy attacking at that post. Geographically, the most vulnerable of these army posts is the post by the Sienne river. Therefore it is expected that the first attack from the enemy is going to be on this post of Sienne. The total army strength of France is currently at an all time low. Thus army strength at the post of Sienne is not much and in case of an attack it will need backup from the other army posts. Thus, it is very necessary for the French troops at all the other posts to be able to move quickly to the post of Sienne in case of an attack.

There is a road network connecting the army posts. Each of these roads has an army post at either end. The roads are bidirectional, i.e. the army at any one of these posts can move on the road to reach the post at the other end. The soldiers can also take a sequence of roads to go to the required post for backing it up.

The enemy is suspected to make an attempt to destroy exactly one road of this network so that the post of Sienne can not receive full backup from some or all of the other posts. Fearing this, the French King has asked Leonardo Da Vinci to construct a few more similar roads connecting these army posts. Even if exactly one of the roads gets destroyed by the enemy, this construction must ensure that the post of Sienne can receive backup from all the remaining army posts.

Your goal is to help Leonardo and tell him the minimum number of roads that need to be built to make this possible. You are given the information about the road network connecting the army posts. There are N army posts, labelled $1, 2, \ldots, N$ with the post of Sienne being labelled 1. Currently there are M roads each connecting 2 army posts. At most one road can exist between two army posts. It is possible that with the given set of roads, you cannot reach some army posts from the post of Sienne.

Input:
The first line of the input contains an integer T, the number of test cases in the file. Then T test cases follow. The first line of each test case contains two space separated integers N and M. Following next are M lines which indicate the M roads. Of these lines, the i^{th} line contains two space separated integers a_i and b_i indicating the army posts connected by the i^{th} road.

Output:
For each test case, print in a separate line the minimum number of roads that need to be built to achieve the above goal. If it is not possible print -1.

Constraints:
$1 \leq T \leq 13$
$1 \leq N \leq 5000$
$0 \leq M \leq 131313$
$1 \leq a_i, b_i \leq N$
For no pair i and j $(i \neq j)$ both $a_i = a_j$ and $b_i = b_j$.
The maximum number of lines in each file would be 500000.

Time Limits: 1 sec

Sample Input:

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

Sample Output:

```
1
```

Explanation
Adding road $1, 4$ will ensure that each army post is connected to 1 even if any road fails.

Problem G
Edit Distance Revisited

You are given N arrays of size K each, such that each array contains all numbers from 1 to K, and no two arrays are the same (two arrays are called same if for every index they have the same value).

Edit distance between two arrays A_1 and A_2 is denoted by $E(A_1, A_2)$, and is defined as the least number of steps needed to make the two arrays same if these 2 operations are allowed:

1. Delete any element from one of the arrays.
2. Insert any element at any position in one of the arrays.

You have to find an arrangement A such that:

1. Each element of A is one of the arrays in the input.
2. Each of the arrays in the input occur atleast once in A.
3. A first increases lexicographically then decreases. Formally, let $X < Y$ mean that array X is lexicographically smaller than array Y. If size of arrangement A is L, then there exists an $i(1 \leq i \leq L)$ such that $A_1 < A_2, A_2 < A_3$ ... $A_{i-1} < A_i$ and $A_{i+1} < A_i, A_{i+2} < A_{i+1}$ ... $A_L < A_{L-1}$.
4. Of all the arrangements satisfying above 3 properties, A has the least sum of edit distances of neighbouring elements. Formally, $E(A_1, A_2) + E(A_2, A_3) +$ ... $+ E(A_{L-1}, A_L)$ is smallest possible among all arrangements satisfying above 3 properties.

For such an arrangement, output the value $E(A_1, A_2) + E(A_2, A_3) +$ ... $+ E(A_{L-1}, A_L)$.

Input:
First line contains T, the number of testcases. First line of each test case contains two integers N and K.
Each of the next N lines of each testcase contains K space separated integers.

Output:
Output one line per testcase containing the required answer.

Constraints:
$1 \leq T \leq 5$
$1 \leq N \leq 1000$
$1 \leq K \leq 100$

Time Limits: 32 secs

Sample Input:

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

Sample Output:

```
6
```

Problem H
Displaying Da Vinci's work

The King of Florence is going to visit Da Vinci in his workshop to see his paintings. In preparation of that, Da Vinci has painted a total of N paintings that he would display to the King. Since, the King is very busy dealing with the after effects of war, he has asked Da Vinci to make sure that he can see all of his paintings in one standing. To solve that problem, Da Vinci has done the following:

He has manufactured N tables, each one of a different height. He plans to keep tables in a row and display a painting at the top of each table. This way, the King will be able to see all the paintings when he is standing in front of this row of tables. All the paintings are of equal height.

This plan of Da Vinci was perfect but he received the news of another rebellion in Florence. He knows that since King has promised to see Da Vinci's work, he won't back down. Da Vinci does not want to hold the King for too long and now has decided that he will only show K of his paintings to the King. For that, he will re-arrange the tables so that the King can only see K of his paintings when he is standing at the front of the row. King can see a painting if there is no painting in front of it in the row, which is blocking King's view. Da Vinci will not remove any tables, because if King decides that he wants to look at more of Da Vinci's work, he wants to be able to show it without adding anymore delay.

All of Da Vinci's paintings are the best in the world, so he knows he can choose any of his K paintings to display to the King. Help Da Vinci in finding in how many ways he can arrange the table so that only K of his paintings are visible to the King.

Input:
The first line of the input contains an integer T which is the number of test cases to follow. Then T lines follow, each containing two space separated integers N and K.

Output:
For each of the test cases, print the total number of ways Da Vinci can make them sit in a row. Since this number can be very large, output it modulo 1000000007.

Constraints:
$1 \leq T \leq 501501$
$1 \leq N \leq 1000$
$0 \leq K \leq 1000$

Time Limit: 7 secs

Sample Input:

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

Sample Output:

```
1
1
11
```

Problem I
Teaching binary to a child

Da Vinci was once wandering on the roads of Florence when he found a child playing with a binary string L. He was delighted to see that a small child was showing interest in the beautiful world of binary strings. To further interest the child and to make sure that the child keeps on playing with binary strings, he gave the child a task:
Each day the child has to now play with the binary string that comes lexicographically after the string that he was playing with on the previous day.

He promised the child that whenever he visits back, he will ask him the string that he should be playing with. If the child gets the correct string, he will recieve a reward from Da Vinci, and may be Da Vinci will take him as his student.

Help the child to find what string he should be playing with on the day Da Vinci visits him back.

Input:
First line contains T, the number of testcases.
It is followed by $2T$ lines, 2 lines per testcase.
First line of each testcase starts with a binary string L. Second line contains a single integer K, number of days after which Da Vinci visits the child.
The binary string has no leading zeroes, e.g., 0111 has a 0 in the leading (first) position, and such strings will not be there in the input.

Output:
For each testcase, output one line containing the required answer. The output string should not have leading zeroes.

Constraints:
$1 \leq T \leq 1000$
$1 \leq N \leq 1000$
$1 \leq K \leq 10^{18}$

Time Limits: 1 secs

Sample Input:

```
2
1001
1
1000
3
```

Sample Output:

```
1010
1011
```

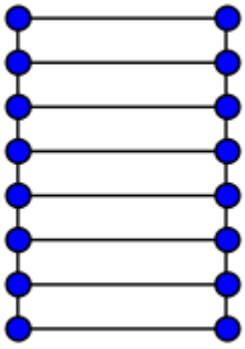
Problem J
Handling the explosives

War is inevitable now that the King has refused to fulfill the demands of the enemy neighbour. The King has sought Da Vinci's help in devising a strategy to not lose to the barbarous enemy neighbour. Leonardo assured him that he can produce chemical explosives (yes chemical explosives!! Leonardo has always been generations ahead of the people) which have the potential to destroy the enemy army within seconds.

The chemical explosives need to be handled with care. Leonardo has developed K different types of explosives. He has a very large number of explosives of each type so that there is no shortage during war. Most of these explosives are kept far from the city in Leonardo's lab among the mountains near the Sienne river. The King suspects an attack in a few days and he wants some explosives to be stored near the palace. Leonardo knows that storing these explosives in the city can be quite dangerous. But due to the urgent requirements put up during this war, he has to bring some of the explosives in the city.

Leonardo thinks that the dungeons is the safest place inside the city to store these explosives. There are two major pathways A and B inside the dungeons which run parallel to each other and are 1 metre apart. There are N cross pathways which intersect A and B perpendicularly. These N cross pathways are spread evenly over the lengths of A and B with the adjacent cross pathways being 1 metre apart from each other. Each cross pathway intersects with both the major pathways A and B. The point of intersection of a pathway and a cross pathway is called a *junction point*. In this way, there are $J(= 2N)$ *junction points* inside the dungeons.

See the figure below to have a clear picture of the structure of the dungeons.



The explosives made by Leonardo are made of a special inflammable material. For safety purposes, explosives of the same type have to be placed at least $\sqrt{2}$ metres apart, otherwise they will explode. Whereas, the explosives of different types need to be placed only 1 metre apart to prevent their self explosion.

Leonardo plans on putting these explosives at the junction points only. He doesn't want any of the explosives to explode on its own and thus wants to keep them at adequate distance from each other. It is not necessary to bring every type of explosive from the lab among the mountains. Leonardo will only bring those explosives which he can arrange safely. Your task is to figure out the number of ways in which it is safe to arrange $2N$ explosives on the junction points.

Input:
Input contains a number of test cases. The first line of input contains an integer T. Next T lines follow, each containing two space separated integers N and K.

Output:
For each test case, output in a separate line the total number of ways in which Leonardo can arrange the explosives. The answer can be very big so output it modulo 1000000007.

Constraints:
$1 \leq T \leq 60000$
$1 \leq N \leq 10^{18}$
$2 \leq K \leq 10^{9}$

Time Limits: 2 secs

Sample Input:

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

Sample Output:

```
2
6
84
```

Problem K
Unlock Leonardo's Secrets

The Second Italian War of 1499 has started and the French troops have attacked Milan. Leonardo Da Vinci is worried for the safety of his diary where he keeps the secrets of all his creations. He would never want that diary to get into the hands of the French King. For this, he creates a special box which can only be opened if you enter a special key K. K is an $N-1$ length string containing only lowercase letters of the English alphabet. But when Leonardo was putting his diary into the box and was about to lock it with the key, the French soldiers walk in. They saw the key entered by Leonardo and have taken him captive and have possession of the box.

But knowing the reputation of Leonardo, they are being cautious and have captured one of Leonardo's apprentices to gather more information on how to open the box. The apprentice (after torture) provided them with the following information:

- Leonardo has made the box in such a way that you could lock it by entering any N length string L of lowercase letters such that removing exactly one letter from L gives K, the string that will unlock the box. The soldiers have seen Leonardo entering N in the box.
- If they enter a wrong key, the contents of the box will be destroyed by an acidic substance hidden inside the box.
- It may happen that the box is rigged to hurt the person trying to open the box, by possibly throwing some acidic substance over his hands.

The soldiers have now decided not to take the risk of getting acid burns and have forced the apprentice to open the box on the condition that his life will be spared only if he opens the box without damage. The apprentice fearing for his life, has entered a string K as the unlock pattern.

Given the two strings L and K, the one entered by Leonardo, and the one entered by the apprentice respectively, can you tell whether Leonardo's secrets will be uncovered or not?

Input:
The first line contains an integer T which is the number of test cases to solve. It is followed by $2T$ lines containing the test cases. Each test case consists of 2 strings L and K, respectively in separate lines.

Output:
For each test case print the output in a separate line. If Leonardo's secrets are now in hands of French soldier, print 1 otherwise 0.

Constraints:
$1 \leq T \leq 100$
$1 \leq N \leq 20000$

Time limit: 2 secs

Sample Input:

```
5
acmicpc
acicpc
acmicpc
acmicp
acmicpc
cmicpc
acmicpc
acmcpi
acmicpc
cmicpa
```

Sample Output:

```
1
1
1
0
0
```

Problem L
Finding Identity Integers

Define function F on set of positive integers as
$F(1) = \{0\}$, set of size 1 containing number 0
$F(p) = \{1\}$, if p is a prime number
$F(n) = \bigcup\{\{p\} * F(q) + \{q\} * F(p)\}$, where the union is over all possible positive integers p and q greater than 1 such that $p * q = n$.
The $*$ and $+$ operators used over sets are defines as cross products, e.g.,
$\{a, b\} + \{d, e, f\} = \{a + d, a + e, a + f, b + d, b + e, b + f\}$,
$\{a, b\} * \{d, e, f\} = \{a * d, a * e, a * f, b * d, b * e, b * f\}$

A positive integer n is called an "*identity integer*" if $F(n) = \{n\}$. Given multiple queries, each consisting of a single integer K, find the K^{th} "*identity integer*".

Input:
First line contains a single integer Q, denoting the number of queries.
Q lines follow, each containing a single integer K.

Output:
For each query, print a single integer, the K^{th} "*identity integer*" modulo 1000000007.

Constraints:
$1 \leq Q, K \leq 200000$

Time Limits: 3 secs

Sample Input:

```
1
1
```

Sample Output:

```
4
```