Problem A: Afghan Jerseys

Afghanistan is playing its maiden ICC Cricket World Cup in 2015. After all the war, their cricket board wants to put on a good show to get the people's mind off the strife, and guide it towards the more important kind of conflict — on the pitch. It has therefore decided to give all the players in the country a brand new jersey, with the player's name printed to inspire them to kick butt.

Afghani names being long, they do not fit properly on the jerseys. So the board has decided to compress the names into patterns that match parts of the players' names. To save on the fabric printing cost, each pattern also has to match as many names as possible. The problem has been given to you to solve with your programming skills.

The pattern is given as a string P. Each character of the pattern P is either a lower-case character between 'a' to 'z' or '*'. A '*' matches any number of characters (including 0). For example, the string 'abc' matches patterns "*", "a*" and "*b*", but not "b*".

As the number of players in the country is huge, it's a tedious task to match them individually. Hence, they have collected the most frequently occurring chunks (only lowercase alphabetical letters) from players' names as a string T.

Given a string T, consisting only of lower-case characters 'a' to 'z', they want to know how many distinct subsequences of T match a given pattern P modulo 1000000007.

A subsequence of sequence is a sequence of characters that can be derived from the given sequence by deleting some elements without changing the order of the remaining elements. For example, "ace" is a valid subsequence of "abcde", while "aec" is not.

Input:
The first line contains the number of test cases, Q. Q test cases follow. Each test case contains the text T on the first line, followed by the pattern P on the next line.

Output:
Output the answer for each test case on a new line. All answers must be output modulo 1000000007.

Constraints:
1 <= Q <= 50
1 <= |T| <= 1000
1 <= |P| <= 50

Sample Input:

```
4
abc
*
aba
*
ababa
ab
abcbaba
a*b
```

Sample Output:

```
8
7
1
14
```

Explanation:

For the first example, all subsequences (including the empty string) match the pattern "*".

For the second example, note that the string "a" occurs as a subsequence of the text twice, but it should only be counted once.

Time limit to be provided separately

Problem B – Road Decoration

Australia and New Zealand have started working on preparation for the World Cup 2015. There are N important venues (like hotels and stadiums) in the city. Out of these important venues, there is one central location where the opening and closing ceremony will be held. There is an existing network of bidirectional roads connecting these venues. The organizing committee has planned to decorate some of these roads that will be used for commuting. They have decided to choose the roads to decorate such that there is exactly one decorated path to all the venues from the central location.

New Zealand is supposed to decorate these roads and Australia has taken up the responsibility of providing transportation. Only decorated roads can be used for transportation. Australia wanted to save fuel costs, and so they wanted to choose the decorated roads to minimize the total sum of distances to all venues from the central location. However, New Zealand had their own plans to minimize decoration cost by choosing the decorated roads such that the sum of the length of the chosen roads will be minimized.

To prevent a fight breaking out between these two rivals before they even step on to the field, you have to help them by reporting if there is a solution in which the two rivals could choose the same set of roads while satisfying their respective constraints.

Input:
The first line contains the number of test cases T.
For each test first line contains N and M which are number of venues and total number of roads respectively.
Then next M lines for each case contains u, v and w - indicating that there is a bidirectional road of distance w between locations u and v.
The central location is identified with location 0.

Output:
For each test case, output the required answer on a separate line. If there is a valid plan, then print “YES”. Else, print “NO” (quotes for clarity).
Note: If any of the venues is not reachable from the central location, then print “NO”.

Constraints:
1 <= T <= 10000
1 <= N <= 20000
0 <= M <= 40000
0 <= u < N
0 <= v < N
u != v
1 <= w <= 10^9

The sum of values of N over all test cases will not be more than 1000000.

The sum of values of N over all test cases will not be more than 2000000.

Example:
Sample Input:
3
3 3
0 1 1
0 2 2
1 2 2
3 1
0 1 1
4 5
2 1 9
3 2 5
0 3 9
0 1 2
3 1 9

Sample Output:
YES
NO
NO

Explanation:
For the first case, both of them can choose the roads {0<-->1, 0<-->2}.
For the second case, venue 2 is not reachable from the central location 0.

Time limit to be provided separately.

Problem C – Dhoni's Bowlers

The Indian team is known for their strong batting and sloppy bowling. The captain M.S. Dhoni is concerned about this issue. He wants to address this by pairing up bowlers who have good economy rates.

He has all the bowlers' economy rates as integers. Unfortunately, these are T20 figures and to convert them to ODI format, he wants to pair up bowlers in such a way that the sum of the economy rates of two bowlers, modulo M, is always less than or equal to X.

Given the economy rates, M and X, can you tell him how many such ordered pairs are possible?

Note: The pair of bowlers chosen by him can be the same. Yeah, Dhoni has won a cup in all limited over formats, but he definitely needs to sharpen his math skills.

Input:
The first line contains the number of test cases T. Each test case contains N, M and X on the first line, followed by N space separated integers A[1..N] on the second line.

Output:
Output T lines, containing the answer for the corresponding test case.

Constraints:
1 <= T <= 10
1 <= N <= 100000
0 <= X < M <= 100000
0 <= A[i] <= 1000000000

Sample Input:
```
2
3 5 3
1 2 3
4 7 4
31 12 11 17
```

Sample Output:
```
6
12
```

Explanation:
For the first example, the valid pairs are (1, 1), (1, 2), (2, 1), (2, 3), (3, 2), (3, 3).

Time limit to be provided separately.

Problem D – Matryoshka Dolls

The Cricket World Cup 2015 is nearing and it will be held in Australia and New Zealand. The organizing committee is planning to give a welcome gift to each team member. After careful thought and planning, they have decided on Matryoshka dolls.

A Matryoshka doll refers to a set of wooden dolls of strictly decreasing size, placed one inside the other. Any doll can contain only one doll directly inside it.

Given the sizes of N dolls, output "YES" if it is possible to nest them all and have one doll on the outside and "NO" otherwise.

Input:
The input starts with T denoting the number of test cases. For each test case, the first line contains N, which is the total number of dolls.
The second line contains N space separated integers denoting the size of the dolls.

Output:
Print “YES” if the dolls can be nested inside each other and “NO” otherwise. (quotes for clarity)

Constraints:
1 <= T <= 100
1 <= N <= 100
1 <= doll size <= 1000

Sample Input:
```
3
3
3 1 1
2
1 2
4
10 2 5 3
```

Sample Output:
```
NO
YES
YES
```

Explanation:
For the first case, there are 2 dolls of size 1 and hence cannot be nested inside each other.
For the second case, the doll with size 1 can be put inside the doll with size 2

Time limit to be provided separately

Problem E – Kiwi Number

The New Zealand government is super-excited about the Cricket World Cup 2015 happening in their country. Hence, it has decided to conduct a census on cricket to find out how many people are interested in the sport, etc.

The statistics obtained are given to us as a range of numbers from A to B (inclusive). In these statistics, the government is interested in some particular numbers called "Kiwi Numbers".

A number is called a Kiwi Number if it has a prime number of factors. A prime number N has exactly two divisors, 1 and N.

Can you help the government by calculating the number of Kiwi numbers in the given range?

Input:
The first line contains the number of test cases T.
Each of the next T lines contains two space separated numbers A and B.

Output:
For each test case, output the required answer on a separate line.

Constraints:
1 <= T <= 100
2 <= A <= B <= 1000000000
B - A <= 200000

Sample Input:
3
2 10
100 100
578 720

Sample Output:
6
0
23

Explanation:
For the first case, the Kiwi numbers are 2, 3, 4, 5, 7, 9.

Time limit to be provided separately.

Problem F: Jersey Number

It's World cup time, and every player wants to get a cool jersey number. As a result, there was a fight between the players about what jersey number they can have. To resolve this, the committee (ICC) came up with an idea.

They gave a huge string and asked each player to walk in one by one, and select four indices in the string (i, j, k, l) such that i<=j and k<=l and the substrings S[i..j], S[k..l] should have a non-empty substring in common. Also, (i, j, k, l) should not have been chosen by any player who walked in earlier. If the player is able to give a correct answer (i, j, k, l), he gets "i-j-k-l" as his jersey number.

Assuming that there are enough players to claim all valid jersey numbers, and that all players are equally smart (i.e if there is any valid (i, j, k, l), then they'll give the right answer), find the number of distinct jersey numbers that can be assigned.

Note: The huge string chosen by the ICC is hexadecimal. (Only contains '0'-'9' and upper-case characters 'A'-'F').

Input:
The first line of input contains a single integer 'T', denoting the no. of test cases. Each of the following 'T' lines contains a sting S, chosen by the ICC.

Output:
Print one line for each test case, denoting the answer modulo 1000000007.

Constraints:
1 <= T <= 200
1 <= |S| <= 100000
1 <= Sum of |S| over all test cases <= 1000000
S is hexadecimal. (Only contains '0'-'9' and upper-case characters 'A'-'F')

Sample Input:
3
AB
ACC
A2011

Sample Output:
7
30
163

Explanation:
For the case "AB", following are valid jersey numbers:
{"1-1-1-1", "1-1-1-2", "1-2-1-1", "1-2-1-2", "1-2-2-2", "2-2-1-2", "2-2-2-2"}

Time limit to be provided separately

Problem G: Hugphile Order

MCG (Melbourne Cricket Ground) is hosting the finals of the Cricket World Cup 2015. In order to make the coverage as memorable as possible, the organizers have decided to arrange “n” cameras of different resolutions at n different positions on a vertical stand according to a 'Hugphile Order', in remembrance of Phil Hughes.

In a Hugphile Order, the cameras are ordered linearly on a vertical stand at positions p1 to pn, such that the camera at position pi (for i = 2..n) has higher resolution than the camera at position pi/2, where / stands for integer division.

Assuming that the resolutions of the n cameras are in the range 1 to n (both inclusive) and given a camera with resolution “m”, find the number of possible positions where it can be placed on the stand in Hugphile Order.

Input:
First line contains number of testcases, T.
Each of the next T lines contain two space-separated integers, “n” and “m”

Output:
Print the answer for each test case on a separate line.

Constraints:
1 <= T <= 10^5
1 <= n <= 10^18
1 <= m <= n

Sample Input:
3
2 1
4 2
5 3

Sample Output:
1
2
4

Explanation:
For the first example, camera with resolution 1 can come at first location only.
For the third example, camera with resolution 3 can come at any location except first location.

Time limit to be provided separately

Problem H – Opening Pair

Having won the 2011 ICC Cricket World Cup, India is definitely one of the favorites to win the 2015 World Cup. In preparations for the 2015 World Cup, the coach of the Indian cricket team (well, Duncan Fletcher, not Ravi Shastri) wants to experiment with opening batsmen pairs. An opening pair is denoted by (A, B), meaning that batsman A takes strike and batsman B is the non-striker.

There are ’N’ matches remaining before the World Cup starts. Being rather meticulous and eager to keep his high salary, the coach wants to experiment with opening batsmen pairs based on the following conditions:

1) No batsman A should face the first ball in more than 1 match, i.e., cannot be the opening striker in more than 1 match.

2) No batsman B should be the 2nd opener in more than 1 match, i.e., cannot be the opening non-striker in more than 1 match.

3) The same opening pair cannot open the batting in more than one match, i.e., if (A, B) open the batting in some match, then neither (A, B) nor (B, A) can open the batting in any other match.

Note: The opening pair (A, B) is different from the opening pair (B, A). Also, it goes without saying that the two batsmen in the opening pair should be distinct, i.e (A, A) is not a valid opening pair.

The coach has a total of ‘K’ batsmen to choose from, and was wondering in how many ways he could choose the opening pairs for the ’N’ matches.

Input:
The first line of input contains an integer T, denoting the number of test cases.

Each of the following ‘T’ lines contain 2 space separated integers N, K. You need to find the number of ways of choosing the opening pairs for N matches, given ‘K’ players to choose from.

Output:
For each test case, print the required answer **modulo 1000000007** on a separate line.

Constraints:
1 <= T <= 1000
1 <= N <= 10^5
0 <= K <= 10^18
1 <= sum of N over all cases <= 10^6

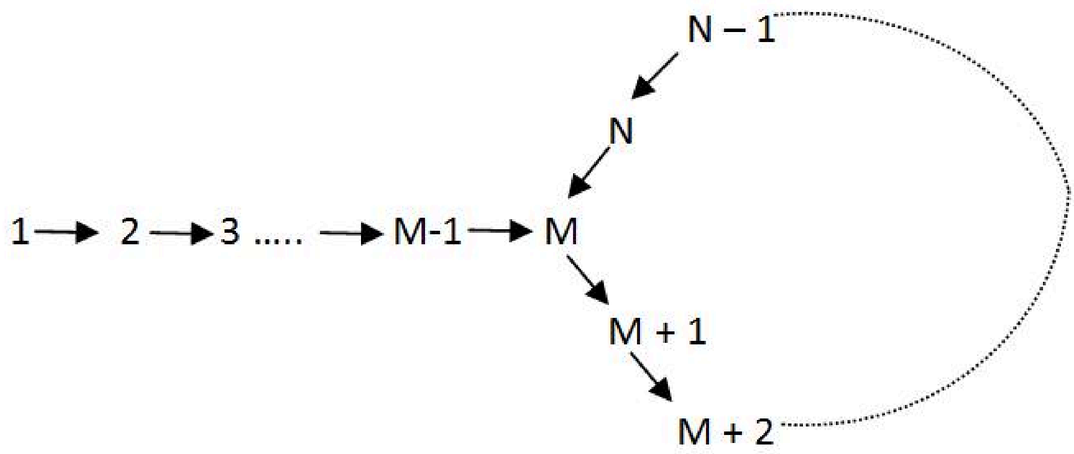
Sample Input:
3
1 2
2 2
3 3

Sample Output:
2
0
12

Explanation:
For the case N=1, K=2, there are 2 ways to choose the opening pairs => {(1,2)}, {(2,1)}
For the case N=3, K=3, there are 12 ways to choose the opening pairs. Some of them are: {(1,3), (2,1), (3,2)}, {(1,2), (2,3), (3,1)}, {(1,2), (3,1), (2,3)}.

Problem I: Gabba Sprint

Virat Kohli and Rohit Sharma are warming up for the World Cup at the Brisbane Cricket Ground, commonly known as "The Gabba". Their coach has asked them to go to the ground at the crack of dawn, and then jog around the stadium in laps. The Cricket Ground has poles spaced equally apart and numbered sequentially from 1 to N. The first M-1 poles lead up to the entrance of the stadium, and the poles numbered M, M+1, ... N are arranged circularly around the stadium, with pole M being next to pole N. Both players start running from pole 1. They always go from pole i to pole i+1, except when i = N, where they go from pole N to pole M.



Due to their different levels of fitness - something that their coach is quite upset about with Virat, that being another story - they have different running speeds P and Q, measured in poles/minute. They have been asked to run for 'S' minutes each. Since they can't keep running for long, the coach has asked them to do short sprints of 1 minute each. First, Virat sprints and covers P poles in 1 minute and stops. Then Rohit sprints and covers Q poles in 1 minute and stops. Virat starts again, and they keep doing this for 2*S minutes (S minutes each). Virat and Rohit are considered to meet if they are at the same pole at the end of some minute. Can you tell how many times they will meet during their jogging routine?

Input:
The first line contains the number of test cases, T. This is followed by T lines, one for each test case. Each test case contains five integers - N, M, S, P and Q.

Output:
For each test case, output the answer on a new line.

Constraints:
$1 \le T \le 100$
$1 \le M < N \le 500$
$1 \le S \le 100000$
$1 \le P,Q \le 500$
$P \ne Q$

Sample Input:
```
2
4 1 4 2 3
5 3 10 1 2
```

Sample Output:
```
1
3
```

Explanation:
For the first example, Kohli's position at the end of his 1st, 2nd, 3rd & 4th minutes of run is {3, 1, 3, 1} respectively. While Rohit's position at the end of his 1st, 2nd, 3rd & 4th minutes of run is {4, 3, 2, 1} respectively. Therefore, they meet exactly once after 8 minutes (their 4 minutes) at pole 1.

For the second example, they would meet at the end of their 3rd (total 6th), 6th (total 12th) & 9th (total 18th) minute of run.

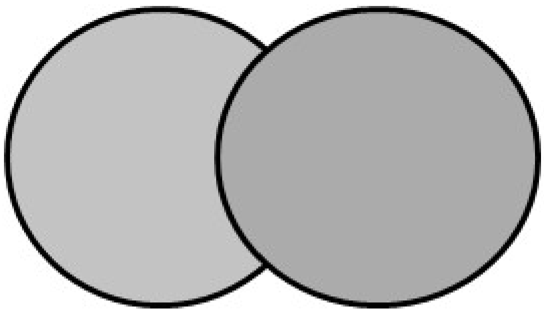
Time limit to be provided separately

SPONSORS
IBM event sponsor
Platinum Sponsor Infosys
Silver Sponsor facebook
Silver Sponsor Directi

Problem J: Artist's Rivalry

The opening ceremony of the 2015 World Cup will be organized in Christchurch, New Zealand on the 14th of February, 2015.

The World Cup organizers have planned an artwork in the form of huge grey circles with black boundaries. They hired number of artists to paint these N circles with each artist painting one circle. However, the artists got carried away by their rivalry and painted over each other's work, resulting in the some circles overlapping with each other. When two circles overlap, only the later painted one is fully visible, and the earlier painted one and its boundary are partly obscured by the later painted one. The organizers are interested in knowing the total length of the visible black boundary after all N circles have been painted.



Input:
The first line contains the number of test cases, T.
For each test case, the first line contains N, the total number of circles. Each of the next N lines contains 3 space-separated integers xi, yi and ri, where (xi, yi) is the centre and ri is the radius of the i-th circle. Assumption is that the ith circle will be painted after the 1 to (i-1)th circles and will obscure the intersecting parts of any of these circles that it overlaps with.

Note**:** No 2 circles will overlap completely. In other words, no 2 circles will have the same center and same radius.

Output:
For each test case, output the length of the total visible boundary colored black. Absolute error of upto 10^-6 is allowed.

Constraints:
1 ≤ T ≤ 100
1 ≤ N ≤ 100
-10^6 <= yi <= 10^6
-10^6 <= yi <= 10^6
    1 <= ri <= 10^6

Sample Input:
2
2
0 0 100
300 0 100
2
0 0 100
150 0 100

Sample Output:
1256.637061
1112.090212

Explanation:
For the first example, both circles' boundary is completely visible.
For the second example, first circle's boundary is partially visible and second circle's boundary is completely visible.

Time limit to be provided separately

Time Limit for the Problems

Problem Code	Problem Name	Time Limit
A	Afghan Jerseys	1 sec
B	Road Decoration	6 sec
C	Dhoni's Bowlers	1 sec
D	Matryoshka Dolls	1 sec
E	Kiwi Numbers	2 sec
F	Jersey Number	6 sec
G	Hugphile Order	3 sec
H	Opening Pairs	3 sec
I	Gabba Sprint	1 sec
J	Artist Rivalry	1 sec

Note: Memory limit for all problems is 256MB

Clarifications:

Problem B – Road Decoration:

In the constraints section, the last 2 lines should be:
"The sum of values of N over all test cases will not be more than 1000000."
"The sum of values of **M** over all test cases will not be more than 2000000."

Problem J – Artist Rivalry:

No 2 circles will be overlap completely. In other words, no 2 circles will have the same center and same radius. Second line of the statement should be: "The World Cup organizers have planned an artwork in the form of huge grey circles with **black** boundaries."

Also, the first line in the Output section should be "For each test case, output the length of the total visible boundary colored **black**."

Problem E – Kiwi Number:

The sample input should be:

3
2 10

100 100
578 720

There is an extra line with “5” printed in the printed problem statement handed over to you. Please ignore that line. This is the correct sample input. Sample output remains unchanged.