CODEVITA 2019

TIME =4:44PM

QN 1

Distribute Books

Problem Description

For enhancing the book reading, school distributed story books to students as part of the Children's day celebrations.

To increase the reading habit, the class teacher decided to exchange the books every weeks so that everyone will have a different book to read. She wants to know how many possible exchanges are possible.

If they have 4 books and students, the possible exchanges are 9. Bi is the book of i-th student and after the exchange he should get a different book, other than Bi.

B1 B2 B3 B4 - first state, before exchange of the books

B2 B1 B4 B3

B2 B3 B4 B1

B2 B4 B1 B3

B3 B1 B4 B2

B3 B4 B1 B2

B3 B4 B2 B1

B4 B1 B2 B3

B4 B3 B1 B2

B4 B3 B2 B1

Find the number of possible exchanges, if the books are exchanged so that every student will receive a different book.

Constraints

1<= N <= 1000000

Input Format

Input contains one line with N, indicates the number of books and number of students.

Output

Output the answer modulo 1000000007.

Test Case

Explanation

Example 1

Input

4

Output

9

QN2-

Philaland Coin

Problem Description

The problem solvers have found a new Island for coding and named it as Philaland.

These smart people were given a task to make purchase of items at the Island easier by distributing various coins with different value.

Manish has come up with a solution that if we make coins category starting from $1 till the maximum price of item present on Island, then we can purchase any item easily. He added following example to prove his point.

Lets suppose the maximum price of an item is 5$ then we can make coins of {$1, $2, $3, $4, $5} to purchase any item ranging from $1 till $5.

Now Manisha, being a keen observer suggested that we could actually minimize the number of coins required and gave following distribution {$1, $2, $3}. According to him any item can be purchased one time ranging from $1 to $5. Everyone was impressed with both of them.

Your task is to help Manisha come up with minimum number of denominations for any arbitrary max price in Philaland.

Constraints

1<=T<=100

1<=N<=5000

Input Format

First line contains an integer T denoting the number of test cases.

Next T lines contains an integer N denoting the maximum price of the item present on Philaland.

Output

For each test case print a single line denoting the minimum number of denominations of coins required.

Test Case

Explanation

Example 1

Input

2

10

5

Output

4

3

Explanation

For test case 1, N=10.

According to Manish {$1, $2, $3,... $10} must be distributed.

But as per Manisha only {$1, $2, $3, $4} coins are enough to purchase any item ranging from $1 to $10. Hence minimum is 4. Likewise denominations could also be {$1, $2, $3, $5}. Hence answer is still 4.

For test case 2, N=5.

According to Manish {$1, $2, $3, $4, $5} must be distributed.

But as per Manisha only {$1, $2, $3} coins are enough to purchase any item ranging from $1 to $5. Hence minimum is 3. Likewise denominations could also be {$1, $2, $4}. Hence answer is still 3.

QN3-

King Placement

Problem Description

This is a typical chess game where your opponent first places random number of Knights, Rooks, Bishop and Queens on an N*N chess board and then you have to place your king safely on chess board such that it should not be under attack by any piece.

Note: if you don't know how to play chess and how chess pieces moves, please refer below link (you can concentrate only on how the above mentioned pieces moves).

https://www.instructables.com/id/Playing-Chess/

Given an N*N chessboard with K number of Knights, R number of Rooks, B number of Bishops and Q number of queens. Your task is to find out number of squares on the chess board such that your King is not checked by any of your opponents pieces.

Constraints

2<=N<=50

0<=K+R+B+Q <=N*N

0<=i, j <=N-1

Input Format

First line provides an integer N

Next line contains K, no. of Knights. Next K lines provide 2 space separated integers denoting the rank and the file of the Knights (i,j)

Next line contains R, no. of Rooks. Next R lines provide 2 space separated integers denoting the rank and the file of the Rooks (i,j)

Next line contains B, no. of Bishops. Next B lines provide 2 space separated integers denoting the rank and the file of the Bishops (i,j)

Next line contains Q, no. of Queens. Next Q lines provide 2 space separated integers denoting the rank and the file of the Queens (i,j)

Output

Number of squares where King can be placed safely.

Test Case

Explanation

Example 1

Input

4

2

0 0

1 1

1

2 2

0

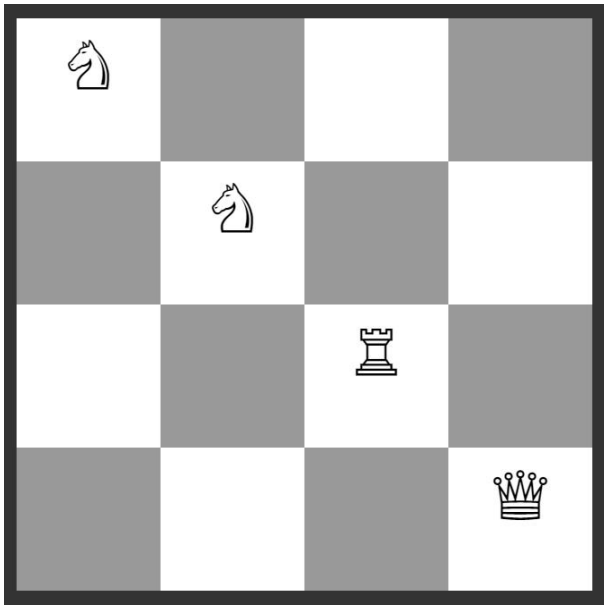
1

3 3

Output

2

Explanation



The image shows the arrangement of the pieces. After the placement of all the Pieces as per the input chess board looks like the image above,

You can place King in 2 places safely. i.e., (0,1) and (1,0)

Example 2

Input

8

4

2 6

3 2

5 6

7 7

4

2 2

4 6

6 4

7 5

4

0 4

1 1

1 6

5 1

2

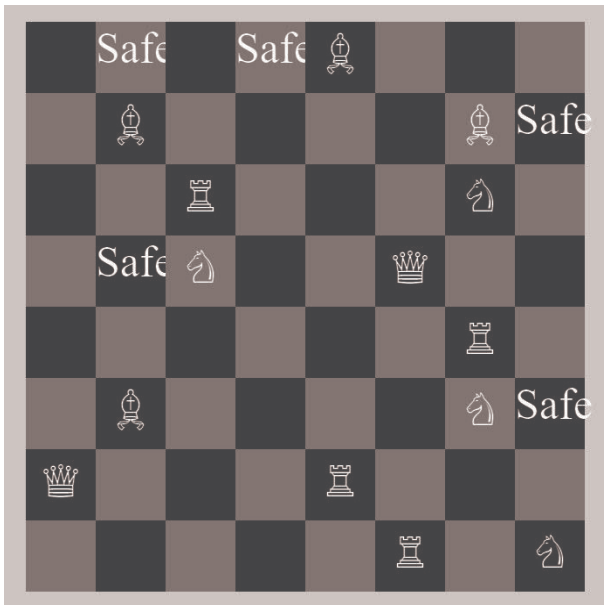
3 5

6 0

Output

5

Explanation


Safe
Safe
Safe
Safe
Safe

QN4-

Television Sets

Problem Description

Dr. Vishnu is opening a new world class hospital in a small town designed to be the first preference of the patients in the city. Hospital has N rooms of two types - with TV and without TV, with daily rates of R1 and R2 respectively.

However, from his experience Dr. Vishnu knows that the number of patients is not constant throughout the year, instead it follows a pattern. The number of patients on any given day of the year is given by the following formula –

(6-M)^2 + |D-15| where
M is the number of month (1 for jan, 2 for feb ...12 for dec) and
D is the date (1,2...31).
All patients prefer *without TV* rooms as they are cheaper, but will opt for *with TV* rooms only if *without TV* rooms are not available. Hospital has a revenue target for the first year of operation. Given this target and the values of N, R1 and R2 you need to identify the number of TVs the hospital should buy so that it meets the revenue target. Assume the Hospital opens on 1st Jan and year is a non-leap year.

Constraints

Hospital opens on 1st Jan in an ordinary year

5 <= Number of rooms <= 100

500 <= Room Rates <= 5000

0 <= Target revenue < 90000000

Input Format

First line provides an integer N that denotes the number of rooms in the hospital

Second line provides two space-delimited integers that denote the rates of rooms with TV (R1) and without TV (R2) respectively

Third line provides the revenue target

Output

Minimum number of TVs the hospital needs to buy to meet its revenue target. If it cannot achieve its target, print the total number of rooms in the hospital.

Test Case

Explanation

Example 1

Input

20

1500 1000

7000000

Output

14

Explanation

Using the formula, number of patients on 1st Jan will be 39, on 2nd Jan will be 38 and so on. Considering there are only twenty rooms and rates of both type of rooms are 1500 and 1000 respectively, we will need 14 TV sets to get revenue of 7119500. With 13 TV sets Total revenue will be less than 7000000

Example 2

Input

10

1000 1500

10000000

Output

10

Explanation

In the above example, the target will not be achieved, even by equipping all the rooms with TV. Hence, the answer is 10 i.e. total number of rooms in the hospital.

QN5-

War Companion

Problem Description

Infinity War is Over. Thanos has successfully collected all the Infinity Stones and wiped out half the population of the universe. Now the world depends on the remaining Avengers to bring back their loved ones.

To get a last chance of defeating Thanos, the Avengers has put together a team of its best warriors to try to steal the Infinity Gauntlet and restore order to the universe. The warriors must be put in pairs into its warships and sent out. Obviously, the team size is even.

Each warrior in the warship needs to work well with his partner in the warship, and chemistry between them is important. Hence the Supreme Commander has requested all the warriors to give a list of the remaining warriors in the team in the order of their preferring to work with them.

Using these lists the Supreme Commander needs to create a set of suitable pairs of warriors, with each warrior getting a partner. A set of pairings of warriors is not suitable if two warriors exist who both prefer each other more than their existing partner. The Supreme Commander recognizes that there can be more than one set of suitable pairs of warriors. He ranks the warriors in descending order of competence, so that the most competent are at the top. He has directed you, his chief analyst, to create a suitable set of pairings that lets the most competent warrior to partner someone as high in list of preferences as possible, and then the next most competent warrior to work with as high a person on his list as possible, and so on.

Please write a program to create a suitable set of pairings that meets the Supreme Commander’s directions. If no such pairing exits, indicate that.

Constraints

N <= 10

Input Format

First line contains the number of warriors (N).

Next N lines contain the preference list of N warriors, where the first word in the line is the warrior and the next (N-1) words are the warriors in the preference order.

The N lines give the warriors in order of decreasing competence

Output

A set of suitable pairs as directed by the Supreme Commander. If no suitable sets exist, output “No Suitable Pairs.”.

Test Case

Explanation

Example 1

Input

6

Ironman Thor Blackwidow Hawkeye Hulk Captainamerica

Thor BlackwidowCaptainamerica Hawkeye Ironman Hulk

Hulk BlackwidowCaptainamerica Hawkeye Ironman Thor

Blackwidow Hawkeye Hulk Ironman Captainamerica Thor

Captainamerica Hawkeye Hulk Blackwidow Thor Ironman

Hawkeye Ironman Thor Blackwidow Hulk Captainamerica

Output

Ironman,Hawkeye

Thor,Captainamerica

Hulk,Blackwidow

Explanation

This is a suitable set of pairs. If we take a pair of warriors, say Thor and Blackwidow,though Thor prefers Blackwidow to his current partner (Captainamerica), Blackwidow prefers the current partner(Hulk) to Thor. Similarly all other pairs of warriors can be checked to see that this is a suitable set of pairings.

Example 2

Input

4

Charles Wolverine Jean Deadpool

Wolverine Jean Charles Deadpool

Jean Charles Wolverine Deadpool

Deadpool Charles Wolverine Jean

Output

No Suitable Pairs.

Explanation

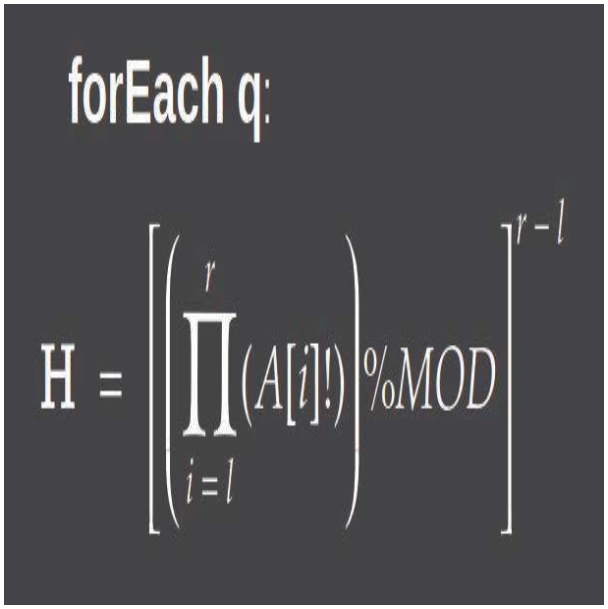
It can be seen that there is no suitable set of pairings. If Deadpool is paired with say Charles, and the other two paired with each other, consider the warriors Charles and Jean. Charles prefers Jean to his current partner, Deadpool, and Jean prefers Charles to the current partner, Wolverine. Hence this is not a suitable pairing. Similarly, Deadpool cannot be paired with anyone else to form a suitable set. Thus the output is “No Suitable Pairs”

QN6-

Hermoine Number

Problem Description

Voldemort is finally dead. Hermoine is bored and has now developed some interest in mathematics, so she keeps challenging her friends. Harry is now one of the victims to those hard problems and needs your help to solve this puzzle.



She calls the result to be Hermoine Number H.

Since H can be large, you need to print the result modulo MOD = **1000000007**

Constraints

N <= 10^5

A[i] <= 10^5

Input Format

First line provides an integer N denoting number of elements in Array A

Second line provides N space separated values for the array A,

Third Line provides an integer denoting Query (q) corresponding the problem statement

Next q lines contain two numbers l, r denoting the values mentioned above in the statement

Output

q lines containing the value of H mod **1000000007**

Test Case

Explanation

Example 1

Input

5

1 2 3 4 5

2

2 2

2 4

Output

1

82944

Example 2

Input

10

77883 48760 68269 31574 57351 20528 45398 54148 37399 31382

10

5 9

2 8

2 9

6 6

1 3

1 9

7 8

6 10

2 7

1 2

Output

667891964

31641898

769678014

1

29992112

654285930

776096678

444042335

886182048

728170986