

Replay of Intra AUST Programming Contest, Spring 2020

<https://toph.co/c/intra-aust-spring-2020-r>



Schedule

The contest will run for **5h0m0s**.

Authors

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Rules

This contest is formatted as per the official rules of ICPC Regional Programming Contests.

You can use Bash 5.0, Brainf*ck, C# Mono 6.0, C++11 GCC 7.4, C++14 GCC 8.3, C++17 GCC 9.2, C11 GCC 9.2, Common Lisp SBCL 2.0, Erlang 22.3, Free Pascal 3.0, Go 1.13, Haskell 8.6, Java 1.8, Kotlin 1.1, Node.js 10.16, Perl 5.30, PHP 7.2, PyPy 7.1 (2.7), PyPy 7.1 (3.6), Python 2.7, Python 3.7, Python 3.8, Ruby 2.6, Swift 5.3, and Whitespace in this contest.

Be fair, be honest. Plagiarism will result in disqualification. Judges' decisions will be final.

Notes

There are 11 challenges in this contest.

Please make sure this booklet contains all of the pages.

If you find any discrepancies between the printed copy and the problem statements in Toph Arena, please rely on the later.

A. Mr. X and Balloon Race

Mr. X is going to plan a game for the upcoming picnic for his company. Here are the rules,

Every team has n members.

1. You will give a balloon to the first member of your team who you want to go first.
2. After the start of the game, that member will blow the balloon.
3. There will be a bucket at distance d from the starting point.
4. After blowing the balloon, he will run and put the balloon in that bucket and pick a new balloon.
5. Come back to the starting point and give that balloon to another member or keep himself and repeat from 3.
6. A team will disqualify if there is any member who didn't perform this task and another member performs this task more than 1 time.

Now Mr. X knows who are in his team, and he also collects the data which member takes how many seconds (**a**) to blow the balloon and also how many seconds (**b**) that member will take to go from the starting point to the bucket. Now Mr. X wants to know the maximum number of balloons they can put into that bucket within s seconds.

Input

At first, there will be an integer T ($1 \leq T \leq 10$), which is the number of test cases.

The first line of each test case contains three integers n , d and s , separated by spaces.

Then there will be n lines each containing 2 integers a and b represent each team members seconds needs to blow the balloon and seconds needs to go from starting point to bucket point.

$1 \leq n, d, s, a, b \leq 100000$

Output

For each test case, print "**Case #c: #m**" without quote where **#c** represent the case number and **#m** represents the maximum number of balloons can be put by Mx. X's team.

Samples

<u>Input</u>	<u>Output</u>
1 2 1 6 1 1 1 1	Case 1: 2

B. Shake It

Shoaib, Tashreef, Rifat and Parvez have entered a race competition as team and successfully become champion on behalf of AUST. The judges asked each of them to **seat in a round table** and to **handshake with other simultaneously** in such a way that **none of them cross each other** before taking prizes. While doing this, an interesting problem came to Shoaib's mind. In how many ways this can be performed at a fixed position if there are $2N$ number of people? As an example, for 4 (here, $N=2$) of them the answer is 2 (Illustrated in following diagram). Shoaib is currently busy celebrating the win. So, he seeks your help. Please note that no one can seat idly. That means one must handshake with another person.



Input

The first line contains an integer T denoting the number of test cases. Each of the test cases starts with an integer, S that indicates the number of N s under a particular test case. The next S lines will contain one integer, N .

- $1 \leq T \leq 100$
- $1 \leq S \leq 16$
- $1 \leq N \leq 16$

Output

Print a number denoting the number of ways. Print an extra new line after each test case.

Samples

<u>Input</u>	<u>Output</u>
1 3 4 1 2	14 1 2

C. Copy and Replace

We have to do a lot of assignments during our university life, some of which are pretty boring. So, we often do copy and paste. Most of us have already mastered that particular skill. But you know some of our teachers are very strict and for that, we do copy and replace instead of copy and paste. I know you are already an expert at it and this problem is similar to copy and replace operation so solve it as fast as you can.

You are given two arrays of integers $x_1, x_2, x_3 \dots x_n$ ($0 \leq x_i \leq 10^9; 1 \leq i \leq n$) and $y_1, y_2, y_3 \dots y_n$ ($0 \leq y_i \leq 10^9; 1 \leq i \leq n$) of length **n**. Now you have to execute **q** queries of two types of the following form:

- **1 a b k** : Copy the subsegment of array **x** of length **k**, starting from position **a**, into array **y**, starting from position **b**, that is, execute $y_{b+j} = x_{a+j}$ for all integer **j** ($0 \leq j < k$). The given operation is correct — both subsegments do not touch nonexistent elements.
- **2 l r** : Find and print the difference between maximum and minimum value from array **y** in range **l** to **r**(inclusive).

Input

The first line contains two integers **n** and **q** ($1 \leq n \leq 100000, 1 \leq q \leq 100000$) the length of the arrays and the number of queries correspondingly. The second line contains array **x** and the third line contains array **y**. Next **q** lines contain queries in the form described in the statement.

Output

For each query of second type print the result on a single line.

Samples

<u>Input</u>	<u>Output</u>
5 4 1 2 3 9 5 6 7 8 1 2 1 2 4 2 2 1 5 1 1 2 4 2 1 5	6 8

D. Get Puzzled!

Tashfiq, Rifat and Tashreef are the contest moderators of the Intra AUST Programming Contest Spring 2020 and problemsetters of the contest as well. Three of them have different programming language preferences. They live in three different places and the three of them are fond of three different favourite seniors.

You have to solve the following tasks based on the provided hints.

In first line, print the name of the place Tashreef lives in.

In second line, print the name of the favourite senior of Tashfiq.

In third line, print the favourite programming language of Rifat.

Hints:

1. The person who lives in Hatirjheel likes C++.
2. Hatirjheel is next to Gulshan.
3. Gulshan is in the left corner of the city.
4. The person whom favourite senior is Akash likes Java.
5. The person lives in Gulshan is fond of Dipu.
6. Tashfiq lives next to the Gulshan.
7. Rifat lives in Gulshan.
8. Three different programming languages: C++, Java, Python
9. Three favourite seniors: Akash, Shuvro, Dipu

*Assume, Gulshan, Hatirjheel and Dhanmondi lie in same line.

Output

Dhaka

Turja

PHP

Sample output is for better understanding. These are not the actual answers

E. Complex Tashreef

Tashreef finally received the Zuinness Journal of Galactic records recognition for being the most complex thinker in the whole Milky Way galaxy!!

He will be participating in the intergalactic level next. To ensure the pride of our Milky Way many are helping him to become more and more complex by giving their assistance. His friend, Tashfiq has also been contributing, and he has given the following problem for him to solve!

Tashreef will be given two positive integers **L** and **R**. He needs to find the value of -

$$\sum_{p=L}^R \sum_{q=0}^p \left(\binom{p}{q} \% 2 == 0 \right)$$

But the problem was too complex even for the legendary Tashreef. He asked you to help him solve this problem. Help him find the answer.

As the result can be very large, print the answer modulo $1000000007 (10^9 + 7)$

Input

The first line will contain an integer **T** denoting the number of test cases. The next **T** lines will contain two integers each, **L** and **R**.

- $1 \leq T \leq 2 \cdot 10^5$
- $0 \leq L \leq R \leq 10^{14}$

Output

For each test, output a single line "**Case N: X**" (without quotation), where **N** is the test number (starting from 1) and **X** is the answer (see examples for clarification).

Samples

<u>Input</u>	<u>Output</u>
5 78 100 34 67 12 25 34 34 55 61	Case 1: 1654 Case 2: 1253 Case 3: 171 Case 4: 31 Case 5: 261

F. The Crossover Everybody Asked For: Rise of the Thorn Villain Duckducula

After the crossing of some millennia the forever feared one has arisen. Inflicting fear, tormenting the heart – the very name of thy one is the expression of solidarity with curses of the **Never Realm** (the place where everything is taking place), **Duckducula** (not [Count Duckula](#)), has woken for the first time from his slumber. His powers were thought to be a myth and existence was considered history less story. The appearance of his thorns of eternal stigma was the introduction of terrifying times ahead.

Dire situations called for dire measurements that lead the current empress of Never Realm, Queen **Blachitmutz Rusenjarch Tiffaltanios Natalgenia MMMMCCCXVIII**, to invoke the **Pact of Schinezmard**. Thus, brings the crossover everybody asked for!!!!

Anime universes come together and start wrecking "hammock"! Superheroes were summoned from different anime universes through the pact. The great pact invoked Kurosaki Ichigo, Uzumaki Naruto, Etherious Natsu Dragneel (E.N.D.), Dragon's Sin of Wrath Meliodas, Son Goku (Kakkarot), Monkey D. Luffy, Saitama, Kuzan, Wings of Despair Acnologia, Uchiha Madara and so on (Protagonist, Antagonist, Villain, side characters, all alike)!!!

The summoned parties took their own opinion and while great people took side of the Realm, there were people who sided with Duckducula. Then again there were some who considered the situation was too much of a pain and decided to lay it out. It was found that entities from 38 different anime verses were summoned and list of those animes are:

Rise of the Shield hero	Demon Slayer	Naruto	Bleach
Dragon Ball Saga	Fairy Tail	Seven Deathly Sins	One Piece
Saitama	How Not to Summon a Demon King	The Melancholy of Haruhi Suzumiya	Jujutsu Kaisen
Letter Bee	Samurai X	Fate Saga	Stigma of the Wind
Darker than Black	Code Geass	Attack on Titan	Blassreiter
Blood +	Eureka 7	Tower of Druaga	007 Ghost
No Game No Life	Buso Renkin	Fullmetal Alchemist	My Hero Academia
Sword Art Online	Hunter x Hunter	Gurren Lagann	Black Butler
Inuyasha	The Darwin's Game	Beelzebub	Full Metal Panic!
Fire Force	Wise Man's Grandchild		

The final battle is going to take place at **Pit of Miasma** in the **Valley of Sorrengeti**. As the fight is about to get started, lord Duckducula seems to be tensed. His **Aura of Charchams** has affected all the summons and also has deployed a legendary power

known as **Blessings of Argonaut**. The blessing, bestowed upon which has a 96% probability of winning in the fight. The problem is, nobody knows when and who will be blessed by it.

So, Duckducula used his **Plankhis Vision** which allowed him to see probability of what sets of characters will probably take part in the fight and see which side is supposed to win. He also saw that **without the presence of any anime verse in one side, it becomes defeated on the spot**.

When the fight begins a **Quote** is heard from the sky. The length of that Quote is known as **Khalrak**. Duckducula could also see in his vision which anime verse characters will join in fight siding with whom. The largest prime number smaller or equal to Khalrak is known as **Doubarchisas**.

Codename **Undoubtable**, a secret spy of Never Realm, has managed to get the data of Plankhis Vision through risking his life and the Never Realm Empire now also has the data. Both sides want to see if they get the fighting chance to win in this war and **both of them want to play optimally** because the very existence of the realm is at stake in this fight.

The Argonaut has a high chance of being invoked in the side where the integer division of Doubarchisas by **Yalamakh** is higher. If the score is same, then Argonaut bestows upon Bell Cranel from Danmachi who is not even summoned to Never Realm.

You ask what is Yalamakh? Well, it is simple! Yalamakh is the number of anime verses in favor of the side.

Given a number of test cases, make a prediction whether the Realm be toppled or will the empire throttle!! A lot rests upon it.

Input

First line of input contains an integer **T**, denoting number of test cases. **3T** lines follow. i^{th} , $(i + 1)^{th}$ and $(i + 2)^{th}$ line make up for one test case; where $0 \leq i < T$.

1. The first line of test case contains an integer **N**, denoting the number of anime universes who are joining the fight in the Empire side and Duckducula side.
2. The next line contains **N** space separated name of anime. Each anime name is enclosed in third bracket. If an anime name is *anime_name* then if the anime characters have joined empire, their name will be written as *[anime_name]* or if in Duckducula side it will be written as *]anime_name[* and obviously same anime can be in both the sides. You may see sample input for better understanding.
3. The last line of a test case will contain some sentences in a single line, rather to say the Quote which will provide Khalrak.

The Constraints are:

- $0 < T < 6$
- $0 < N < 77$
- $1 < \text{Length of Quote} < 10000000$

Output

For each test case first print **"The Argonaut Shines Upon thy Who is for thy Worthy!!!!:"** without the quote in a new line.

After that, without quote

- if Empire has high probability of winning, print **"Never Realm Empire"**
- if Duckducula has high probability of winning, print **"Thorn Villain Duckducula"**
- if both have same probability, print **"Go find Kami Hestia Fast!!"**

You may see sample output for better understanding.

Samples

<u>Input</u>	<u>Output</u>
2 5 [One Piece] [Bleach] [Naruto]]The Darwin's Game[]Fire Force[The will of D. has not faded. 3]Inuyasha[]Hunter x Hunter[[Demon Slayer] Fear is not evil. It tells you what your weakness is. And once you know your weakness, you can become stronger as well as kinder.	The Argonaut Shines Upon thy Who is for thy Worthy!!!!: Thorn Villain Duckducula The Argonaut Shines Upon thy Who is for thy Worthy!!!!: Never Realm Empire
For First Case: The quote contains a total length of 29. There are three anime verse in side of the Realm while 2 anime verse in side with Duckducula. For Second Case: The quote contains a total length of 129. There are one anime verse in side of the Realm while 2 anime verse in side with Duckducula.	

G. Basic Calculation

Little Klee had just learned how to do arithmetic operations. She just does operations without following any rules of mathematical expressions. She wants you to calculate the same way.

Input

The first line of input will contain **T(≤100)** the number of test cases. Then following each line will contain a string containing digits & operators (**+**, **-**, *****) which stands for addition, subtraction & multiplication.

Note:

- String will contain at most 1000 characters
- No two operators will be together in the string

Output

Output of each test case will follow the following format:

case #x: y, where **x** stands for number of test case and **y** is the answer after the calculation.

Note:

- As the answer could be very big, you are asked to print it modulo $10^9 + 7(1000000007)$
- The final answer will always be positive

See the sample for better understanding.

Samples

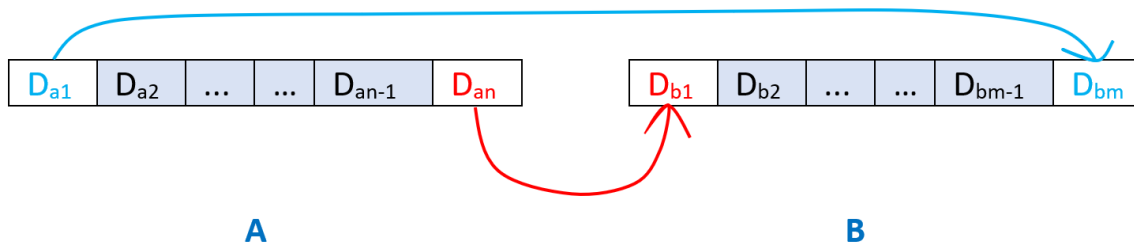
<u>Input</u>	<u>Output</u>
4 1+2*3 1-10 2*2+3*4 123123123123+123123123123123123123	case #1: 9 case #2: 999999998 case #3: 28 case #4: 384389558

<u>Input</u>	<u>Output</u>
<p>For case 1:</p> <ul style="list-style-type: none"> • $1 + 2 = 3$ • $3 * 3 = 9$ • $9 \text{ modulo } 10^9 + 7 = 9$ <p>So the final answer is 9 (as Klee doesn't want you to follow arithmetic operation rules, you just have to calculate as the digits and operators appear)</p> <p>For case 2:</p> <ul style="list-style-type: none"> • $1 - 10 = -9$ • $-9 \text{ modulo } 10^9 + 7 = 999999998$ 	

H. Reverse Number

You are given an integer N and a digit D . You have to count the number of pairs A and B ($1 \leq A, B \leq N$) such that

1. A and B do not contain any leading zeros
2. Last digit of A is equal to the first digit of B
3. First digit of A is equal to last digit of B and
4. Except for the the first and last digits of both integer A and B , there must be at least one digit present in both A and B which is equal to the given digit D .



Print the answer modulo $1000000007(10^9 + 7)$.

Input

First line contains an integer T ($T \leq 100000$) denoting test cases. Then T line follows two space separated integers N and D .

$$1 \leq N \leq 10^{18}$$

$$0 \leq D \leq 9$$

Output

Print a single line the the number of pair satisfy the condition for each test cases.

Samples

Input	Output
5 111 1 222 2 245 3 555 3 100 5	1 4 4 25 0
<p>In second sample (N = 222, D = 2) the valid pairs are (A = 121 B = 121) (A = 122 B = 221) (A = 221 B = 122) and (A = 222 B = 222)</p> <p>In third sample (N = 245, D = 3) the valid pairs are (A = 131 B = 131) (A = 132 B = 231) (A = 231 B = 132) and (A = 232 B = 232)</p> <p>In fourth sample (555, 3) some of the valid pair are (334, 433), (433, 334), (531, 135), (135, 531), (333, 333), (434, 434) ...</p>	

I. Which One Is Larger?

You will be given two integers l and r where $l \leq r$. There are three functions named **F0**, **F1** and **F2**.

These functions are described as below:

```
FUNCTION F0 (ARGUMENT a, ARGUMENT b)
  RETURN a × b
END F0
```

```
FUNCTION F1 (ARGUMENT l, ARGUMENT r)
  IF l == r
    RETURN r
  END IF
  a ← l
  b ← F1 (l + 1, r)
  c ← F0 (a, b)
  RETURN c
END F1
```

```
FUNCTION F2 (ARGUMENT l, ARGUMENT r)
  x ← r - l + 1
  z ← l
  y ← x - 1
  m ← 2 × z
  RETURN (x × (m + y)) / 2
END F2
```

Let, $A = F2(l, r)$ and $B = F1(l, r)$. Can you determine which one is larger between **A** and **B**?

Input

First line of input consists of a single integer **T** ($1 \leq T \leq 100000$) that denotes the number of test cases. Next **T** lines are followed by two integers l and r .

$$-10^{100} \leq l \leq r \leq 10^{100}$$

Output

If **A** is larger than **B**, print "0". If **B** is larger than **A**, print "1". When it is not possible to determine which one is larger, print "-1".

Samples

<u>Input</u>	<u>Output</u>
1 1 10	1

J. Beautiful String

Given **3** sets of strings **A, B, C** find how many numbers of beautiful strings can be created from these sets. All the strings are consisted of lower case English letters only.

A beautiful string is concatenation of 3 string **p, q, r**. Which means if **x** is a beautiful string then $x = (p + q + r)$.

Where **p** is from **A**, **q** is from **B** and **r** is from **C**.

And also $\text{lexvalue}(q) > \text{lexvalue}(p)$ and $\text{lexvalue}(r) < \text{lexvalue}(q)$.

lexvalue of a string is demonstrated below with some examples

$\text{lexvalue}("a") = 1$, $\text{lexvalue}("b") = 2$, ..., $\text{lexvalue}("z") = 26$, $\text{lexvalue}("aa") = 27$, $\text{lexvalue}("ab") = 28$, ..., $\text{lexvalue}("az") = 52$, $\text{lexvalue}("ba") = 53$, $\text{lexvalue}("bb") = 54$, ..., $\text{lexvalue}("bz") = 78$, ..., $\text{lexvalue}("za") = 677$, $\text{lexvalue}("zb") = 678$, ..., $\text{lexvalue}("zz") = 702$, $\text{lexvalue}("aaa") = 703$, $\text{lexvalue}("aab") = 704$, ..., $\text{lexvalue}("aaz") = 728$, ..., $\text{lexvalue}("zzz") = 18278$, ...

Input

First line contains 3 integers. Number of strings in set **A, B, C** respectively. In next 3 lines there will be 3 sets of space separated strings.

$1 \leq \text{Number of strings in A, B, C} \leq 10^5$

For all strings, $1 \leq \text{lexvalue}(\text{string}) \leq 10^5$

Output

Print one integer, number of possible beautiful string modulo 999961.

Samples

<u>Input</u>	<u>Output</u>
3 3 2 aa av e s ay t r aas	5

<u>Input</u>	<u>Output</u>
<p>Here in sample test case 5 beautiful string can be made.</p> <p>For "s", we can make "esr" (taking e from set A, s from set B and r from set C.</p> <p>For "ay", we can make "aaayr" (taking aa from set A, ay from set B and r from set C) "avayr" and "eayr" accordingly.</p> <p>For "t", we can make "etr".</p>	

K. Tomb Raider

Lara Croft, the main character of Tomb Raider who travels around the world searching for lost artifacts and infiltrating dangerous tombs and ruins. On every adventure, she has to take various challenges. On this problem, your task is to take Lara to her destination in a way that is the shortest in distance.

Consider a 2D **R** by **C** grid as the map of the tomb where **#** represents blockage, means Lara cannot move to that cell and **.** (dot) represent cells where Lara can enter. **S** represents the starting cell and **E** means where you'll have to take her. By the design of the game, you can take Lara to an adjacent cell that is only to the left, right, up or down directions on a single move.

After moving **N** step(s) an earthquake occurs and the map of the game changes. Some blockages can be removed by the earthquake and/or some accessible cells can turn into blockages due to the wreckage. The coordinate of **S** and **E** remains unchanged. Consider Lara knows how the map will look after the earthquake at the beginning of the game. If Lara steps on a cell on her N^{th} step and that cell becomes a **#** after earthquake, she dies.

Your job is to calculate how many minimum steps does Lara have to take in order to reach her destination safely.

Input

On the first line of input, there will be two numbers **R** & **C** that denotes the number of Rows and Columns of the map.

Then **R** x **C** grid follows that denotes the map of the tomb where **#** represents the inaccessible cells and **.** means accessible cells. **S** denotes the starting position of Lara and **E** denotes the destination of Lara's position.

On the next line, there will be a number **N** which denotes that the number of steps required before the earthquake arrives.

Then **R** x **C** grid follows that denotes the map of the tomb after the earthquake where **#**, **.**, **S**, **E** denotes the same meaning as described above.

$$2 \leq R, C \leq 10^3$$

$$1 \leq N \leq 10^6$$

Output

If it is possible to reach the destination, print the minimum number of steps required.
Otherwise, print **"Not Possible!"** without the double quote.

Samples

<u>Input</u>	<u>Output</u>
<pre>7 7 ##### #S...# #####.# #####.# #####.# #E...# ##### 3 ##### #S...# ###.#.# ###.#.# ###.#.# #E...# #####</pre>	10
<u>Input</u>	<u>Output</u>
<pre>7 7 ##### #S...# #####.# #####.# #####.# #E...# ##### 3 ##### #S...# #####.# #####.# #####.# #E...# #####</pre>	Not Possible!