

*tichnas* is a very hardworking boy 🧑. After working all day finishing his assignments 📄, he sat on his chair and started thinking 🤔 about a great story for the next OJ problem (why?).



It's valentine day 🍷 tomorrow, and by the time the clock hits midnight 🕒, he slept on his chair 🪑. *tichnas* is single, and so are his dreams 🌙.

In his dream, *tichnas* is the army chief in a kingdom 🏰 on an island (well, it's his dream, what else you expect 🤔). He has 100s of warriors with him, and they together have acquired four islands till now 🏝.

A magical power will soon come into the world and demolish all the monarchy 👑 and establish equality.

Before this happens, the warriors decided to attack another island 🏝 (their last attack). After successfully acquiring the fifth island, each warrior who participated will get 100 Oreos 🍪 (like currency in the dream).

*tichnas* has this weird habit of mixing everything in his dreams. He loves Oreo shake and used to drink them almost every day while in college 🎓. Since he is at home now and misses them, they came into his dream 🍷.

Not all the warriors are here to fight, and *tichnas* doesn't want to force them to fight using the brain and weapons of others just for the sake of a few Oreos 🍪.

*tichnas* has some magical powers ✨ and for those warriors who only want to go through this last war, he has created a mystical potion 🧪. A potion that will help easily go through this fight, but will definitely not be helpful for life 🏠.

After drinking the potion, a warrior will become invincible 🌟 and will have supernatural powers. Without any fighting, he'll do his contribution to the attack and get 100 Oreos. There is just one small problem, the potion costs 5 Oreos, so in effect, the warrior will only get 95 Oreos in the end 🍪.

Below are the three stages of the war. Warriors who choose to drink the potion, can skip all the stages and directly go to the end (Input/Output format) and enjoy their free Oreos 🍪.

## Stage 1: Reaching the war site

All the warriors are currently at the island labelled (1,1) and want to attack another island situated at (n,m). There are a lot of islands in between, some of them have volcanos 🌋 and some of them have some (at least one) cute little pink cats 🐾 (it's valentine day).

The cats on each island are labelled in sequence with the name of the island as the prefix. For example, if an island's name is *Tani*, and it has three cats, then the name of the cats will be *Tani1*, *Tani2* and *Tani3*.

The names of all the islands globally are different. Now, it's trivial to see that the names of all the cats worldwide will be unique.

A warrior standing  $i$  on an island  $(i,j)$  can only go to  $j$  islands  $(i+1,j)$  or  $(i,j+1)$ .

A warrior will die if he lands on an island with a volcano 🌋. If there is no volcano, he'll pick up exactly one cat from that island and continue his journey 🐾.

After reaching the destination, a warrior wonders 🤔 what is the total number of possible combinations of cats any warrior can have on reaching the destination 🏠.

## Stage 2: The attack

Superb! Now that all the warriors have reached the island they want to attack, the fight starts ⚔.

It's weird, but the fight is just the warriors defending themselves and the enemy attacking them 🤖.

The enemy is attacking with a total of 26 different types of arrows 🏹. For each type, a warrior also has one shield 🛡 (so there are 26 different types of shield).

If an arrow collides with a shield of the same type, they both will get destroyed 🔪. If the types are different, they'll simply freeze ❄ on collision. No other arrow can pass a frozen arrow.

It's known that all the arrows travel only to the left ➡, and the shields are stationary 🛡.

The fight will be good if all the shields and arrows get destroyed. Given the exact sequence of shields and arrows, tell *tichnas* whether the fight will be good or not.

## Stage 3: Opening the treasure

Well, the fight has ended. Just seeing the efforts of warriors, the enemy surrendered 🙇.

But, the king of the enemy committed suicide, taking away the password to his treasure chest 🗝 with him.

Since the tressure chest has a lot of Oreos in it, it was protected 🛡 very well.

When all this was happening in the dream, in the real world it was already noon and *tichnas*'s sleep became less deep (it's noon, but he still didn't wake up 🌞). With less deep sleep, the dream also became less interesting 🍷.

Now the lock had three numbers written on it, a, b and n, with a and b representing the starting of a series and n representing the n<sup>th</sup>(th) number of the series which is the password 🔑 (details in the end).

The warriors are here, and they need to open the treasure to get their Oreos 🍪)

The last fight will be over after all this 🏠🔑.

To all the warriors who dared to even think of taking this path (and not drinking the potion), *tichnas* wishes them all the very best for this fight, and the future ahead 💪!

This may be the last fight, but the training should never stop 🏋.

Some warriors are already very powerful 🏋, and some may get brutally injured 🤖 in this fight, but remember this is not the end and *"Hard work beats talent when talent doesn't work hard"* 🏋.

With that, the dream ended 🌙.

*tichnas* finally woke up and realized he is no longer an army chief 🤖 (though will be happy to help any warriors out there willing to struggle and fight 🏋).

Maybe after a few nights, *tichnas* will again dream and become the army chief for some of the warriors, maybe not 🍷.

No one really knows what's in the future for *tichnas* and the warriors (and let's not forget about that cute little pink cat 🐾).

Signing off.



## Input Format

Please note that even if you're choosing to skip the whole fight (drink the mystical potion), you still need to take the relevant input, just not do all the stuff (what exactly you need to output is given later).

The first line of input contain an integer q, the type of query.

- If q=1, you need to solve for the Stage 1 (*Reaching the war site*)
  - The second line will contain two integers, n and m, representing the size of world (which is a grid). All the warriors are currently on (1,1) and they need to go to (n,m)
  - The next n lines will contain m characters each. If the character is 'v', it means there is a volcano there, otherwise the character represents the number of cats.
  - Please note that (1,1) and (n,m) can also contain a volcano, in either case there are no combinations of cats a warrior can take to (n,m)
- If q=2, you need to solve for the Stage 2 (*The attack*)
  - The second line will contain an integer t, you need to solve for t independent testcases
  - The next t lines will each contain a string, consisting of English letters. A lowercase letter represents a shield, and the same letter in uppercase represents an arrow of that type.
  - So there are 26 different types, represent by the 26 letters of English, lowercase being the shields and uppercase arrows.
- If q=3, you need to solve for Stage 3 (*Opening the treasure*)
  - The second line will contain an integer t, you need to solve for t independent testcases
  - The next t lines will each contain 3 integers: a, b and n

## Output Format

- If you choose to skip the fight
  - Let r be your roll number
  - Let  $a = 1200 + \text{floor}(r / 1000000) \cdot 1$
  - You need to output the sum of rightmost 2002 digits of  $a^{10^9+7}$
- When q=1
  - Output a single integer, the number of possible combinations of cats a warrior can have at (n,m)
  - Please note that there might not be any way to reach (n,m), in which case the number of possible combinations are 0
  - (1,1) and (n,m) can also contain more than one cats, so handle that also
  - Since the answer can be very large, print the answer modulo 1000000007 (or  $1e9+7$ )
- When q=2
  - For each of the t testcases, the output should be on a different line
  - The output of a testcase is 1 if the fight is good, and 0 otherwise
- When q=3
  - For each of the t testcases, the output should be on a different line
  - The series is formulated as
    - $s(0) = a$
    - $s(1) = b$
    - For all integers  $n \geq 2$ ,  $s(n) = s(n-1) \oplus s(n-2)$ , where  $\oplus$  denotes the bitwise XOR operation
  - The output of a testcase will be the value of  $s(n)$  for a given pair of a and b

## Constraints

The problem consists of 5 subtasks. You need to submit your code separately for all of them.

For those skipping the fight, these constraints doesn't matter. You only need to submit your code in Subtask 1 (that too without solving it, just print the thing specified above, in *Output Format*), and you'll get 95/100 points.

For others, you ONLY need to solve for the 3 stages, no need to do the task for skipping the fight.

- Subtask 1 (96 points)
  - $q=1$
  - $1 \leq n \leq 5$
  - $1 \leq m \leq 5$
  - $grid_i \in \{0, 1, 2, 3, \dots, 9\}$ , where  $grid_i$  is the  $j^{\text{th}}$  character of the  $i^{\text{th}}$  row of the grid
- Subtask 2 (1 point)
  - $q=1$
  - $1 \leq n \leq 1000$
  - $1 \leq m \leq 1000$
  - $grid_i \in \{0, 1, 2, 3, \dots, 9\}$ , where  $grid_i$  is the  $j^{\text{th}}$  character of the  $i^{\text{th}}$  row of the grid
- Subtask 3 (1 point)
  - $q=2$
  - $1 \leq t \leq 1000$
  - $1 \leq |s| \leq 1000$ , where  $|s|$  represents the length of string
  - $s_i \in \{t, T\}$ , where  $s_i$  represents the  $i^{\text{th}}$  character of the string
- Subtask 4 (1 point)
  - $q=2$
  - $1 \leq t \leq 1000$
  - $1 \leq |s| \leq 1000$ , where  $|s|$  represents the length of string
  - $s_i \in \{a, b, c, \dots, z, A, B, C, \dots, Z\}$ , where  $s_i$  represents the  $i^{\text{th}}$  character of the string
- Subtask 5 (1 point)
  - $q=3$
  - $1 \leq t \leq 1000$
  - $0 \leq a \leq 10^9$
  - $0 \leq b \leq 10^9$
  - $0 \leq n \leq 10^9$

## Sample Input

### Input 1

```
1
1 2
48
```

### Output 1

```
32
```

### Input 2

```
1
3 2
33
30
01
```

### Output 2

```
0
```

### Input 3

```
1
3 3
341
404
432
```

### Output 3

```
384
```

### Input 4

```
2
12
a
aaa
aB
Aa
aBcCBA
aBcBCA
aabbccCCBBAA
sanchitTICHNAS
sanhcitTICHNAS
livedDEVIL
cataniINATAC
ShaniPleaseDoTheseProblemsFastAndLetMeKnowIfMyTestCasesAreCorrectThanks
```

### Output 4

```
0
0
0
1
0
1
0
1
1
1
0
```

### Input 5

```
3
4
3 4 2
4 5 0
325 265 1231232
12 3 2002
```

### Output 5

```
7
4
76
3
```