

Hong Kong Secondary Coding Challenge

City University of Hong Kong

July 30, 2022

- A Jordon and Weapons
- B Jordon and Upgrade
- C Jordon and Door Guard
- D Jordon and Locks
- E Jordan and Maze
- F Tree

Reminders (please read carefully)

1. The return value type of the main function in C++ must be int, and the return value when the program ends normally must be 0 .
2. If there is no special instructions, the comparison method of the results is full text comparison (ignoring the spaces at the end of the line and the empty line at the end of the text).
3. The submitted code should be no longer than 50 kilobytes.
4. The detailed compilation options are as follows.

C++	clang++/g++	-O2 -lm -DONLINE_JUDGE -mx32 -std=c++03
C++11	clang++/g++	-O2 -lm -DONLINE_JUDGE -mx32 -std=c++11
C++17	clang++/g++	-O2 -lm -DONLINE_JUDGE -mx32 -std=c++17
Pascal	fpc	-O2

Problem A. Jordon and Weapons (weapon.c/cpp/pas)

Input file: `stdin`
Output file: `stdout`
Time limit: 1 second
Memory limit: 256 megabytes

Jordon, the plumber, is going to rescue Princess Banana. Instead of jumping up and down to dodge the enemies as others did, Jordon decides to fight against the monster. Therefore, Jordon needs to buy some weapons.

The weapons are indexed in the store, the first weapon with index 1, the second weapon with index 2, the i^{th} weapon with index i . There is a rule in the weapon store, customers can only buy the weapon one by one from the first weapon, which means you can only buy the i^{th} weapon after buying the $(i-1)^{\text{th}}$ weapon, except the first weapon.

Jordon knows that weapons with digit 7 in its index are flawless, he wonders how many flawless weapons he will get if he buys N weapons in total.

Input

The input only consists of a positive integer, N .

Output

Output a single integer, the number of flawless weapons Jordon can buy.

Example

<code>stdin</code>	<code>stdout</code>
20	2

In the sample, Jordon will buy weapons with index 1 to 20, and only the 7th and 17th weapon are flawless.

Notes

For all test data, $1 \leq N \leq 10^9$.

Subtask	Score	Additional constraints
1	20	$N = 1000$
2	60	$N \leq 10^5$
3	20	No additional constraints

Problem B. Jordon and Upgrade (upgrade.c/cpp/pas)

Input file: `stdin`
Output file: `stdout`
Time limit: 1 second
Memory limit: 256 megabytes

After buying so many weapons, Jordon finds that none of them are good enough.

A weapon can be represented as a string with lowercase letters only. Two weapons are of the same type if and only if the two strings representing the weapons can be the same by rearranging the letters. For example, weapon `hksc` and `hkcs` are of the same type while `cityhk` and `cuhk` are not.

Jordon finds that he can only upgrade a pair of weapons that are of the same type. What's worse is that his money is running out, and he can only upgrade his weapons once. Please help Jordon find out how many ways there are to upgrade his weapons.

Input

The first line consists of one integer, N , the total number of weapons.

In the following N lines, each line consists of a nonempty string with lowercase letters only, which represents a weapon.

Output

Only one integer, the number of choices to upgrade Jordon's weapons.

Example

stdin	stdout
6 loop polo pool coronavirus carnivorous easy	4

Notes

For all test data, $1 \leq N \leq 10^5$, the length of each string ≤ 20 .

Subtask	Score	Additional constraints
1	10	$N = 2$
2	25	$N \leq 100$
3	25	$N \leq 5000$
4	40	No additional constraints

Problem C. Jordon and Door Guard (guard.c/cpp/pas)

Input file: `stdin`
Output file: `stdout`
Time limit: 1 second
Memory limit: 256 megabytes

After a long journey, Jordon finally arrives at the castle where Princess Banana is being held. To get into the castle, Jordon needs to defeat the door guard first.

Jordon cannot defeat the door guard because the guard is too strong. Luckily, he learnt a spell that can change the strength of the guard.

Denote by N the strength of the door guard. Jordon can use the digits of N to make two integers without leading zero (except 0 itself), and turn the strength of the door guard into the sum of these two integers. For example, Jordon can turn 9408 into 49 and 80, then the sum is 129; or turning 1000 into 1 and 000, then the sum is 1. Please note that Jordon can only use the spell once.

To maximize the winning chance, Jordon wants to minimize the strength of the guard after using the spell. Help him win the fight.

Input

The input only consists of one integer, N , the strength of the door guard.

Output

Only one positive integer, the minimum strength of the door guard after Jordon uses the spell.

Example

<code>stdin</code>	<code>stdout</code>
9408	129

Notes

For all test data, $10 \leq N \leq 10^{18}$.

Subtask	Score	Additional constraints
1	25	$10^3 \leq N \leq 10^4$
2	35	$N \leq 10^8$
3	40	No additional constraints

Problem D. Jordon and Locks (lock.c/cpp/pas)

Input file: `stdin`
Output file: `stdout`
Time limit: 1 second
Memory limit: 256 megabytes

After defeating the door guard, Jordon still cannot save his princess.

He finds that there is a door in front of him with a lock on it. Besides, there is a string S on the lock. To open the lock, it needs to enter 4 lowercase letters.

Jordon finds that the password is a subsequence of S . Please help Jordon to find how many possible kinds of passwords there are in total.

Input

The input only consists of a string S with lowercase letters.

Output

Output an integer in a line, indicating the number of possible passwords.

Example

stdin	stdout
hksscc	8

The possible passwords are `hkcc`, `hksc`, `hkss`, `hsc`, `hssc`, `kcc`, `kssc`, `sscc`.

Notes

For all test data, S contains lowercase letters only. Let $|S|$ be the length of S , $1 \leq |S| \leq 10^5$.

Subtask	Score	Additional constraints
1	10	$ S \leq 26, \forall i \neq j, S_i \neq S_j$
2	30	$ S \leq 100$
3	25	$ S \leq 10^4$
4	35	No additional constraints

Problem E. Jordon and Maze (maze.c/cpp/pas)

Input file: `stdin`
 Output file: `stdout`
 Time limit: 1 second
 Memory limit: 256 megabytes

Jordon kept opening the door for 10 years. His effort moved the god, and the god teleported him to the final step. Jordon can save his Princess Banana after passing this final challenge.

The challenge is a maze that is made of $R \times C$ grids, each grid with an uppercase letter on it. Jordon starts at the top left corner $(1, 1)$, and Princess Banana is at the bottom right corner (R, C) .

Jordon can go either up, right, left or down with 1 second, but not outside the maze. Or Jordan can teleport to any grid that has the same letter as the one he was originally on with 0 second, but he can teleport no more than K times.

Jordon wants to save Princess Banana as quick as possible. Help Jordon to find the minimum time needed.

Input

The first line consists of 3 integers, R , C , and K .

For the following R lines, each line contains C uppercase letters, representing the letter on each cell.

Output

Only one integer, the minimum time needed for Jordon to save Princess Banana.

Example

stdin	stdout
4 6 1 ABCDEF BCDEFA CDEFAB DEFABC	2

Notes

For all test data, $1 \leq R, C \leq 200, 1 \leq K \leq 1000$.

Subtask	Score	Additional constraints
1	20	$R, C \leq 10, K = 1$
2	30	$R, C \leq 200, K = 1$
3	50	No additional constraints

Problem F. Tree (tree.c/cpp/pas)

Input file: `stdin`
 Output file: `stdout`
 Time limit: 3 second
 Memory limit: 256 megabytes

Given a tree whose vertices are numbered $1, 2, \dots, n$ and 1 is its root. It is guaranteed that $1, 2, \dots, n$ is a **dfs order** of this tree.

Let the weight of a simple path $(u, v) (u < v)$ be $u \times v$.

There are m queries l_i, r_i . For each query, calculate the sum of weights of all **simple paths** $(u, v) (u < v)$ whose vertices are all in range $[l_i, r_i]$, module 998244353.

Input

The first line contains two integers n, m , representing the size of the tree and the number of queries.

Then $n - 1$ lines, each line contains two integers u, v , representing an edge.

Then m lines, each line contains two integers l_i, r_i , representing a query.

Output

For each query, print one integer in a line, representing the answer module 998244353.

Example

stdin	stdout
5 5	35
1 2	12
1 3	47
3 4	85
3 5	47
1 4	
2 4	
3 5	
1 5	
2 5	

Notes

For all test data, $n, m \leq 1.5 \times 10^6, 1 \leq l_i \leq r_i \leq n$. It is guaranteed that $1, 2, \dots, n$ is a dfs order of this tree.

The subtasks are not applied in this problem. The additional constraints on the test cases are as follows.

Test case	Score	Additional constraints
1	10	$n, m \leq 100$
2	10	$n, m \leq 2000$
3, 4	20	$n, m \leq 10^5$
5, 6	20	$n, m \leq 6 \times 10^5$
7, 8	20	$u = i, v = i + 1$
9, 10	20	No additional constraints

Please also read the "Constraint and hint" part of this problem on the Online Judge System carefully.