Problem A. Namomo Subsequence

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 seconds
Memory limit:	1024 mebibytes

"gshfd1jkhaRaadfglkjerVcvuy0gf" said Prof. Pang.

To understand Prof. Pang's word, we would like to calculate the number of *namomo subsequences* of it. The word by Prof. Pang is a string s with n characters where each character is either an English letter (lower or upper case) or a digit. The i-th character of s is denoted by $s[i]$ $(1 \le i \le n)$. A subsequence t of s is defined by a list of indices $t_1, \ldots, t_6$ such that $1 \le t_1 < t_2 < \ldots < t_6 \le n$. Let $compare(c_1, c_2)$ be a function on two characters such that $compare(c_1, c_2) = 1$ when $c_1 = c_2$ and $compare(c_1, c_2) = 0$ otherwise. t is a namomo subsequence of s if and only if for any $1 \le i < j \le 6$, $compare(s[t_i], s[t_j]) = compare(namomo[i], namomo[j])$, where $namomo[x]$ represents the x-th character of the string "namomo" $(1 \le x \le 6)$.

Output the number of namomo subsequences of a given string s modulo 998244353.

Input

The first line contains a string s with n characters $(6 \le n \le 1000000)$. s contains only lower case English letters ('a' – 'z'), upper case English letters ('A' – 'Z') and digits ('0' – '9').

Output

Output one integer – the answer modulo 998244353.

Examples

standard input	standard output
`wohaha`	`1`
`momomo`	`0`
`gshfd1jkhaRaadfglkjerVcvuy0gf`	`73`
`retiredMiFaFa0v0`	`33`

Problem B. Rectangle Flip 2

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 seconds
Memory limit:	256 mebibytes

Prof. Pang enters a trap room in a dungeon. The room can be represented by an n by m chessboard. We use (i, j) ($1 \le i \le n$, $1 \le j \le m$) to denote the cell at the i-th row and j-th column. Every second, the floor of one cell breaks apart (so that Prof. Pang can no longer stand on that cell.) After nm seconds, there will be no cell to stand on and Prof. Pang will fall through to the next (deeper and more dangerous) level.

But Prof. Pang knows that calm is the key to overcome any challenge. So instead of being panic, he calculates the number of rectangles such that every cell in it is intact (i.e., not broken) after every second. (A rectangle represented by four integers a, b, c and d ($1 \le a \le b \le n, 1 \le c \le d \le m$) includes all cells (i, j) such that $a \le i \le b, c \le j \le d$. There are $\frac{n(n+1)}{2} \times \frac{m(m+1)}{2}$ rectangles in total.)

Input

The first line contains two integers n, m ($1 \le n, m \le 500$) separated by a single space.

The $(i + 1)$-th line contains two integers a, b separated by a single space representing that the cell (a, b) breaks apart at the i-th second. It is guaranteed that each cell appears exactly once in the input.

Output

Output nm lines. The i-th line should contain the number of rectangles such that every cell in it is intact after the first i cells break apart.

Example

standard input	standard output
2 2 1 1 2 1 1 2 2 2	5 3 1 0

Note

In the example, after the first second, there are 3 rectangles of area 1 and 2 rectangles of area 2 that satisfy the constraint. So the first line should contain a 5. After the second second, only cells in the second column remains intact. The answer should be 3. After the third second, only one cell remains intact. The answer should be 1. After the fourth second, all cells broke apart so the answer should be 0.

Problem C. Random Shuffle

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Prof. Pang is selecting teams that advance to the world final contest. As the regionals are cancelled, he uses random shuffle to rank the teams. There are n teams in total. His code is as follows:

```
uint64_t x;//uint64_t represents 64-bit unsigned integer
int n;
uint64_t rand() {//this is a xor-shift random generator
    x ^= x << 13;
    x ^= x >> 7;
    x ^= x << 17;
    return x;
}
int main() {
    cin >> n;
    cin >> x;
    for (int i = 1; i <= n; i++) {//random shuffle [1, 2,..., n]
        a[i] = i;
        swap(a[i], a[rand() % i + 1]);
    }
    for (int i = 1; i <= n; i++) {//print the result
        cout << a[i] << (i == n ? '\n' : ' ');
    }
}
```

He compiled and ran his code and then entered n and some special nonnegative integer x. He printed the result on paper.

One day later, Prof. Pang forgot his choice for x. You are given the result of the code and the integer n. Please recover the number x that Prof. Pang had entered.

Input

The first line contains a single integer n ($50 \le n \le 100000$) – the number of teams.

The next line contains n integers – the result printed by Prof. Pang's code. It is guaranteed that the result is correct, i.e., there exists an integer x ($0 \le x \le 2^{64} - 1$) that leads to the result.

Output

Output the integer x ($0 \le x \le 2^{64} - 1$) Prof. Pang had entered. If there are multiple possible x's, print any one.

Example

standard input
50 36 22 24 21 27 50 28 14 25 34 18 43 47 13 30 7 10 48 20 16 29 9 8 15 3 31 12 38 19 49 37 1 46 32 4 44 11 35 6 33 26 5 45 17 39 40 2 23 42 41
standard output
16659580358178468547

Note

Note that the second line of the sample input is wrapped to fit in the width of page.

Problem D. City Brain

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	1024 mebibytes

Prof. Pang works for the City Brain program of Capital Grancel. The road network of Grancel can be represented by an undirected graph. Initially, the speed limit on each road is 1m/s. Prof. Pang can increase the speed limit on a road by 1m/s with the cost of 1 dollar. Prof. Pang has k dollars. He can spend any nonnegative integral amount of money on each road. If the speed limit on some road is am/s, it takes $1/a$ seconds for anyone to go through the road in either direction.

After Prof. Pang spent his money, Prof. Du starts to travel from city s_1 to city t_1 and Prof. Wo starts to travel from city s_2 to city t_2. Help Prof. Pang to spend his money wisely to minimize the sum of minimum time of Prof. Du's travel and Prof. Wo's travel. It is guaranteed that s_1 and t_1 are connected by at least one path and that s_2 and t_2 are connected by at least one path.

Input

The first line contains three integers n, m, k ($1 \le n \le 5000$, $0 \le m \le 5000$, $0 \le k \le 10^9$) separated by single spaces denoting the number of vertices, the number of edges in the graph and the number of dollars Prof. Pang has.

Each of the following m lines contains two integers a, b ($1 \le a, b \le n, a \ne b$) separated by a single space denoting the two endpoints of one road. There can be multiple roads between the same pair of cities.

The following line contains four integers s_1, t_1, s_2, t_2 ($1 \le s_1, t_1, s_2, t_2 \le n$) separated by single spaces denoting the starting vertices and ending vertices of Prof. Du and Prof. Wo's travels.

Output

Output one decimal in the only line – the minimum sum of Prof. Du's travel time and Prof. Wo's travel time. The answer will be considered correct if its absolute or relative error does not exceed 10^{-9}.

Examples

standard input	standard output
6 5 1 1 2 3 2 2 4 4 5 4 6 1 5 3 6	5.000000000000
1 0 100 1 1 1 1	0.000000000000
4 2 3 1 2 3 4 1 2 3 4	0.833333333333

Problem F. Rooks

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Prof. Pang plays chess against his rival Prof. Shou. They are the only two players in the game. The chessboard is very large and can be viewed as a 2D plane. Prof. Pang placed n_1 rooks and Prof. Shou placed n_2 rooks. Each rook is a point with integer coordinates on the chessboard. One rook is *attacked* by another rook if they satisfy all of the following conditions:

- They are placed by different players.
- They have the same x-coordinate or y-coordinate.
- There is no other rook on the line segment between them.

Help Prof. Pang and Prof. Shou to decide which rooks are attacked.

Input

The first line contains two integers n_1, n_2 ($1 \le n_1, n_2 \le 200000$) separated by a single space denoting the number of rooks placed by Prof. Pang and the number of rooks placed by Prof. Shou.

The i-th ($1 \le i \le n_1$) line of the next n_1 lines contains two integers x, y ($-10^9 \le x, y \le 10^9$) separated by a single space denoting the location (x, y) of the i-th rook placed by Prof. Pang.

The i-th ($1 \le i \le n_2$) line of the next n_2 lines contains two integers x, y ($-10^9 \le x, y \le 10^9$) separated by a single space denoting the location (x, y) of the i-th rook placed by Prof. Shou.

It is guaranteed that the $n_1 + n_2$ rooks placed by the players are distinct (i.e., no two rooks can have the same location).

Output

Output a string with length n_1 on the first line. The i-th ($1 \le i \le n_1$) character should be 1 if the i-th rook placed by Prof. Pang is attacked and 0 otherwise.

Output a string with length n_2 on the second line. The i-th ($1 \le i \le n_2$) character should be 1 if the i-th rook placed by Prof. Shou is attacked and 0 otherwise.

Example

standard input	standard output
3 2 0 0 0 1 1 0 0 -1 -1 0	100 11

Problem I. Plants vs Zombies

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Prof. Pang is playing *Plants vs Zombies*.

Imagine that the game is played on a number axis. The following are the elements in the game:

- n zombies. The i-th zombie appears at 0 on the number axis at time t_i with health point h_i. The zombies have the same moving speed V and they all move to the right.
- m spikeweeds. The i-th spikeweed is of position p_i and attack power a_i.
- One peashooter at the position of 10^{100}. It shoots K peas of attack power D every second.

Every second in the game is processed as follows:

1. When the x-th second begins, the zombies whose t_is equal x appear at position 0.
2. After that, for each appeared and alive zombie u, it will suffer from the spikeweeds whose positions are in $(P_u, P_u + V]$ where P_u is the current position of the u-th zombie. So its health point will be decreased by $\sum_{1 \le i \le m, P_u < p_i \le P_u + V} a_i$. The zombie dies if its health point is no more than zero. Otherwise, it is still alive and its position will be increased by V.
3. When the x-th second ends, the peashooter shoots K peas in a row. For each pea, it will hit the zombie that is alive and of the maximum position currently. If there are multiple zombies of the maximum position, the pea hits the one of the minimum index. The health point of the zombie being hit decreases by D. This zombie dies if its health point is decreased to some value no more than 0. The peas are processed one by one, not simultaneously. (For example, if a zombie is killed by the first pea, the second pea cannot hit it since it dies before the second pea is shot.) If no alive zombie exists, the remain peas will hit nothing.

Prof. Pang wants to know the death time (in seconds) of all the n zombies.

Input

The first line contains five integers n, m, V, K, D ($1 \le n, m \le 10^5, 1 \le V, K, D \le 10^9$) separated by single spaces.

Each of the following n lines contains two integers t_i, h_i ($1 \le t_i, h_i \le 10^9$) separated by a single space.

Each of the following m lines contains two integers p_i, a_i ($1 \le p_i, a_i \le 10^9$) separated by a single space.

Output

Output one line containing n integers, where the i-th integer denotes the death time (in seconds) of the i-th zombie.

Example

standard input	standard output
3 2 1 2 2 1 11 2 8 1 1 1 2 2 4	2 3 1

Note

During the first second:

- The first zombie appears and then moves to position 1. It suffers 6 damage points (2 from the first spikeweed, 4 from the two peas).
- The third zombie appears and then moves to position 1. It suffers 2 damage points (from the first spikeweed) and dies (since its health point becomes -1).

During the second second:

- The first zombie moves to position 2 and suffers 6 damage points (4 from the second spikeweed, 2 from the first pea) and dies (since its health point becomes -1).
- The second zombie appears and then moves to position 1. It suffers 4 damage points (2 from the first spikeweed, 2 from the second pea).

During the third second:

- The second zombie moves to position 2, suffers 4 damage points (4 from the second spikeweed) and dies (since its health point becomes 0).
- The peas hit no zombie during this second.

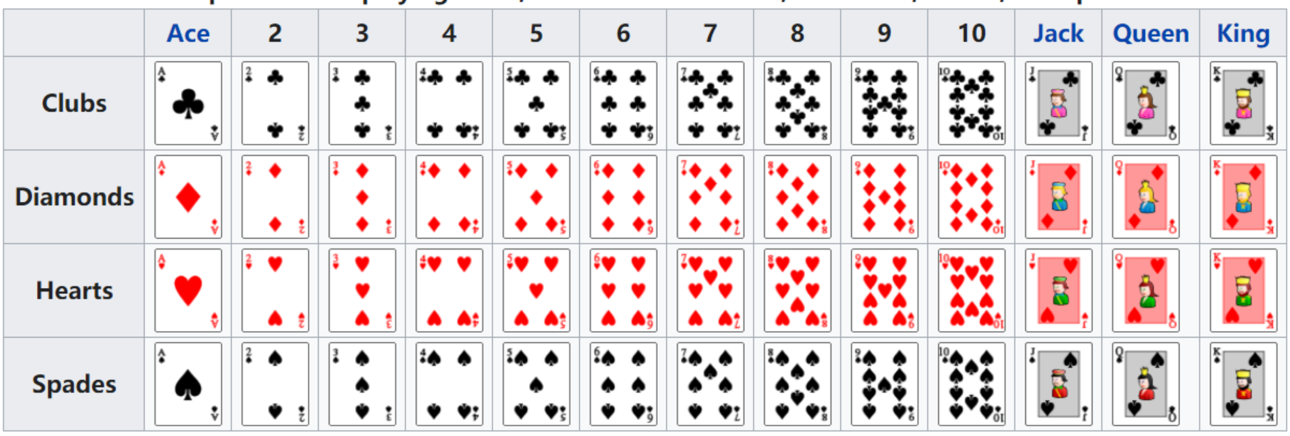
So the death times of the zombies are 2, 3, 1, respectively.

Problem K. Allin

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Texas hold 'em (also known as **Texas holdem**, **hold 'em**, and **holdem**) is one of the most popular variants of the card game of poker. **Please read the following rules as they may be different from the regular rules. Two** cards, known as **hole cards**, are dealt **face-down** to each player. Each player only knows his own hole cards. And then **five community cards** are dealt in three stages **face-up**. The stages consist of a series of three cards ("the flop"), later an additional single card ("the turn" or "fourth street"), and a final card ("the river" or "fifth street"). All players know the face-up cards that are already dealt. All cards are drawn from a standard 52-card deck. A standard 52-card deck comprises 13 ranks in each of the four French suits: clubs (♣), diamonds (♢), hearts (♡) and spades (♠). Each suit includes an Ace (A), a King (K), Queen (Q) and Jack (J), each depicted alongside a symbol of its suit; and numerals or pip cards from the Deuce (Two) to the Ten, with each card depicting that many symbols (pips) of its suit. **No card can be drawn more than once.**

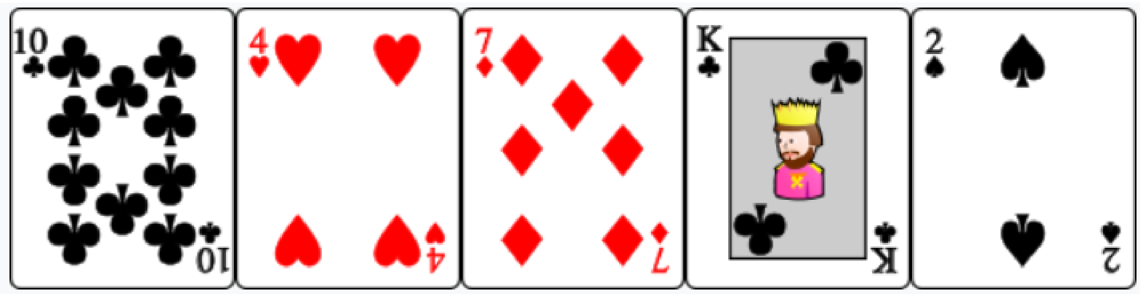
Example set of 52 playing cards; 13 of each suit: clubs, diamonds, hearts, and spades



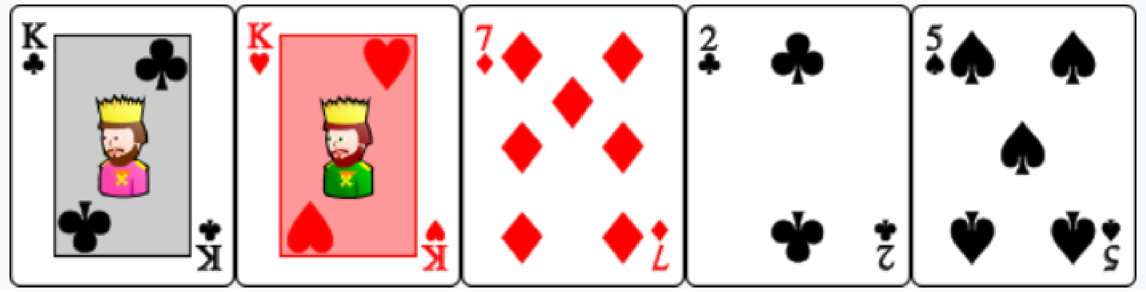
Individual cards are ranked as follows (high-to-low): A, K, Q, J, 10, 9, 8, 7, 6, 5, 4, 3, 2. **Each player seeks the best five-card poker hand from any combination of the seven cards – the five community cards and his two hole cards.**

The following table shows the possible five-card poker hand types in **increasing order** of their values. Each type has a specific ordering of the five cards that is described below. **The following part is describing how to compare two hands, which is the same as the regular rule.**

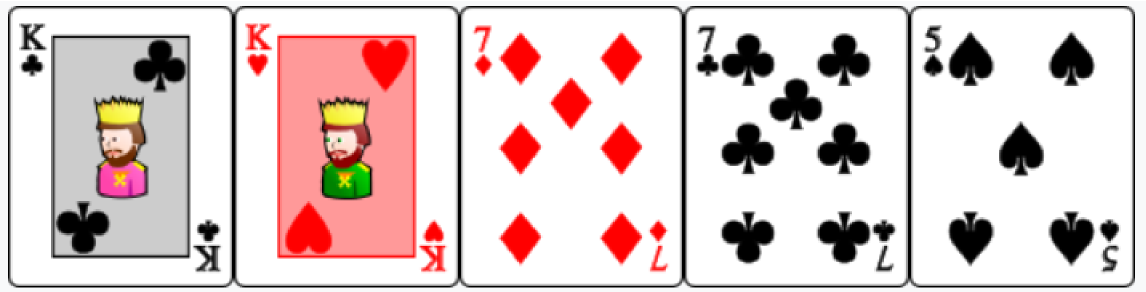
- **Highcard**: Simple value of the card. The cards are ordered as $a_1a_2a_3a_4a_5$ such that $a_1 > a_2 > a_3 > a_4 > a_5$. ($a_i$ represents the rank of i-th card.)



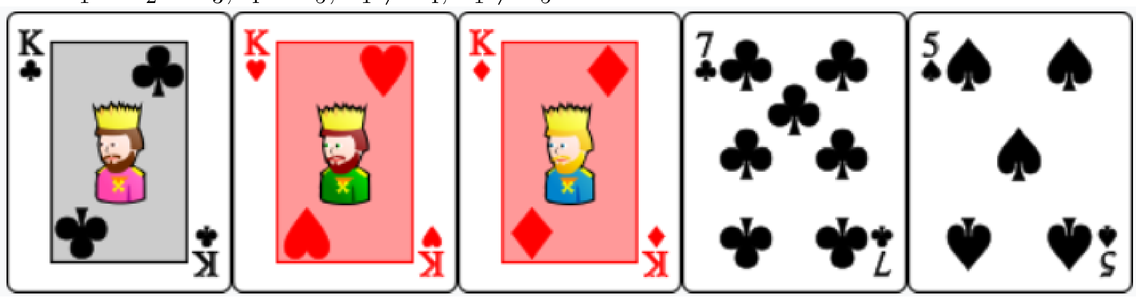
- **Pair**: Two cards with the same value. The cards are ordered as $a_1a_2a_3a_4a_5$ such that $a_1 = a_2$, $a_3 > a_4 > a_5$, $a_1 \neq a_3$, $a_1 \neq a_4$, $a_1 \neq a_5$.



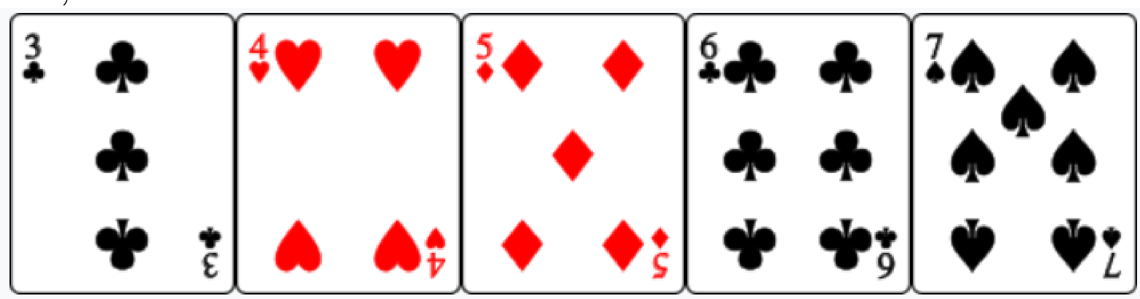
- **Two pairs**: Two times two cards with the same value. The cards are ordered as $a_1a_2a_3a_4a_5$ such that $a_1 = a_2$, $a_3 = a_4$, $a_1 > a_3$, $a_1 \neq a_5$, $a_3 \neq a_5$.



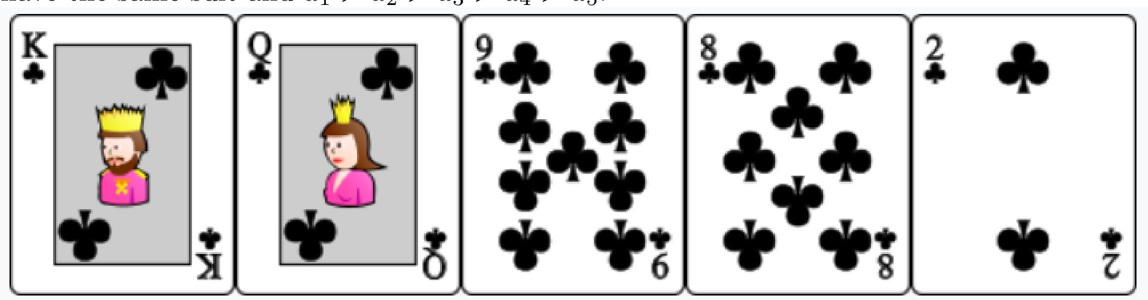
- **Three of a kind**: Three cards with the same value. The cards are ordered as $a_1a_2a_3a_4a_5$ such that $a_1 = a_2 = a_3$,$a_4 > a_5$, $a_1 \neq a_4$, $a_1 \neq a_5$.



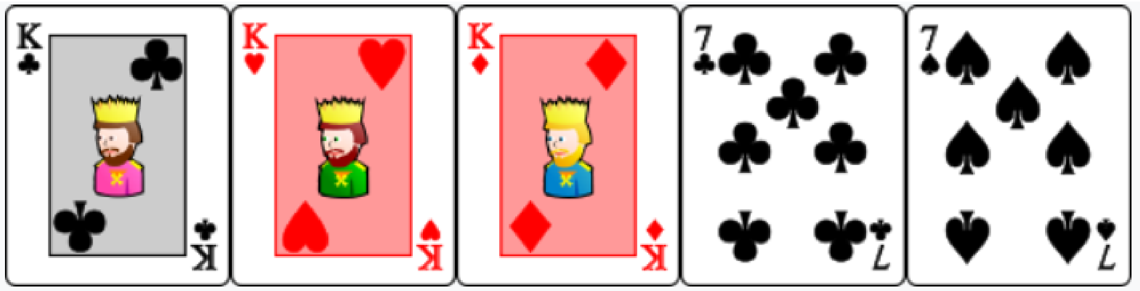
- **Straight**: Sequence of 5 cards in increasing value. The cards are ordered as $a_1a_2a_3a_4a_5$ such that a_i is exactly one rank above a_{i+1} for all $1 \leq i \leq 4$. **Specially, if a_5 is Ace, a_4 can be 2. In this case, Ace is considered one rank below 2.**



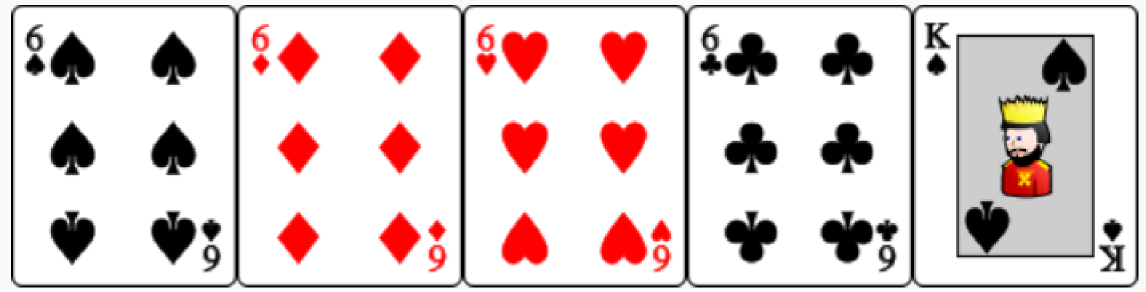
- **Flush**: 5 cards of the same suit. The cards are ordered as $a_1a_2a_3a_4a_5$ such that all the five cards have the same suit and $a_1 > a_2 > a_3 > a_4 > a_5$.



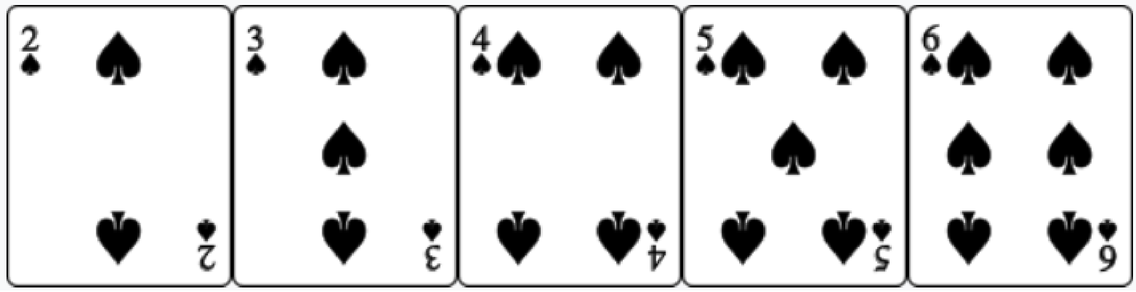
- **Full house**: Combination of three of a kind and a pair. The cards are ordered as $a_1a_2a_3a_4a_5$ such that $a_1 = a_2 = a_3$, $a_4 = a_5$.



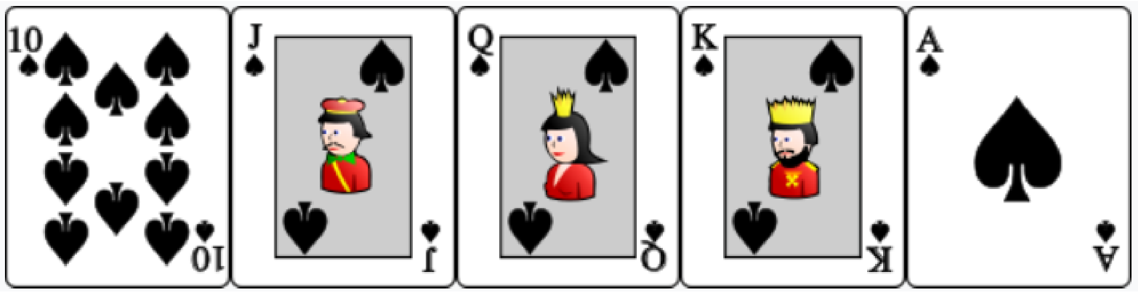
- **Four of a kind**: Four cards of the same value. The cards are ordered as $a_1a_2a_3a_4a_5$ such that $a_1 = a_2 = a_3 = a_4$.



- **Straight flush**: Straight of the same suit. The cards are ordered as $a_1a_2a_3a_4a_5$ such that all the five cards have the same suit and that a_i is exactly one rank above a_{i+1} for all $1 \le i \le 4$. **Specially, if a_5 is Ace, a_4 can be 2. In this case, Ace is considered one rank below 2.**



- **Royal flush**: Straight flush from Ten to Ace. The cards are ordered as $a_1a_2a_3a_4a_5$ such that a_1, a_2, a_3, a_4, a_5 are Ace, King, Queen, Jack, Ten of the same suit.



To compare two hands, first, we will compare the type of two hands. For example, one hand is **Four of a kind**, the other hand is **Full house**, **Four of a kind** always win **Full house**.

If the types of two hands are the same, we compare the ranks of the cards. We will order the card as described above, and compare them one by one. Firstly, we will compare the first card. If a hand's first card has a higher rank, it wins. If the first cards of the two hands have the same rank, we will compare the second card, and so on. If the cards have the same rank in every position, no one wins. The suit of cards never matters. For example, ♣ 5, ♢ 5, ♡ 5, ♠ 2, ♣ 2 can win ♢ 3, ♠ 3, ♡ 3, ♢ A, ♡ A. Since they are both **Full house**, and we will compare the ranks of the three cards of a kind at first.

Consider the case that the hole cards of Alice are ♣ A, ♢ 4 and the hole cards of Bob are ♡ 2, ♠ 3. The community cards are ♠ A, ♡ 4, ♠ 5, ♣ Q, ♡ Q. The best hand of Alice (five cards among her hole cards and the community hards) is ♣ A, ♠ A, ♣ Q, ♡ Q, ♠ 5, which is **Two pairs**. The best hand of Bob is ♠ 5, ♡ 4, ♠ 3, ♡ 2, ♠ A, which is **Straight**. Thus, Bob wins.

Players have betting options to check, call, raise, or fold. **In this problem, we do not care about the meanings of these bets.** Rounds of betting take place before the flop is dealt and after each subsequent deal. The player who has the best hand and has not folded by the end of all betting rounds wins all of the money bet for the hand, known as the pot. In certain situations, a "split-pot" or "tie" can occur when two players have hands of equivalent value. This is also called a "chop-pot". **In this problem, we assume the two players never fold.** So the player with the best five-card poker hand from any combination of the seven cards wins. If the two players have hands of equal values, no one wins.

To simplify the statement, we do not introduce the detailed rules here.

Daddy Dream is a world-famous **Texas hold 'em** player. As a strong challenger, Wolf Chicken wants to beat Daddy Dream. Wolf Chicken plays first after "the flop" (three cards are dealt face-up). Both players know the three face-up cards and each player knows his own two hole cards. Wolf Chicken will choose to allin if and only if he will certainly win whatever the "the turn", "the river" (the remaining two community cards that have not been revealed) and Daddy Dream's hole cards are. Otherwise, Wolf Chicken will choose to check.

Given Wolf Chicken's two hole cards and the three flop cards, help him to determine whether he can allin.

Input

The first line contains a single integer T ($1 \le T \le 100000$) denoting the number of test cases.

For each test case, there is one line containing five strings h_1, h_2, c_1, c_2, c_3 separated by single spaces denoting the first hole card, the second hole card, the first community card, the second community card and the third community card.

For each card, the first character of its corresponding string denotes its rank. (Possible ranks are '2' ,'3','4','5','6','7','8','9','T','J','Q','K','A'. 'T' denotes 10.) The second character denotes its suit. 'C' denotes clubs. 'D' denotes diamonds. 'H' denotes hearts. 'S' denotes spades.

It is guaranteed that each card appears at most once in one test case.

Output

For each test case, print one line. Print "`allin`" if Wolf Chicken will certainly win. Otherwise, print "`check`".

Example

standard input	standard output
2 AC KC QC JC TC AC TD 8S 5H 2C	allin check

Problem L. Square

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Father Study loves math very much.

Given a sequence of integers $a_1, a_2, ..., a_n$, Father Study wants to calculate another sequence of integers $t_1, t_2, ..., t_n$ satisifing

- For each i $(1 \le i \le n)$, $t_i > 0$.
- For each i $(1 \le i < n)$, $a_i \times t_i \times a_{i+1} \times t_{i+1}$ is a square number. (In mathematics, a square number or perfect square is an integer that is the square of an integer, in other words, it is the product of some integer with itself.)
- $\prod_{i=1}^{n} t_i$ is minimized.

Please help Father Study to calculate the answer — the minimum value of $\prod_{i=1}^{n} t_i$. Because the answer is too large, please output the answer modulo 1000000007.

Input

The first line contains a single integer n $(1 \le n \le 100000)$.

The second line contains n integers $a_1, a_2, ..., a_n$ $(1 \le a_i \le 1000000)$ separated by single spaces.

Output

Output one integer – the answer modulo 1000000007.

Example

standard input	standard output
3 2 3 6	6

Problem N. Fake Results

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

A group of students is taking a True/False exam. Each question is worth one point. You, as their teacher, want to make your students look as good as possible — so you cheat! (I know, you would never actually do that.) To cheat, you manipulate the answer key so that the lowest score in the class is as high as possible.

What is the best possible lowest score you can achieve?

Input

The first line of input contains two integers n ($1 \leq n \leq 1,000$) and k ($1 \leq k \leq 10$), where n is the number of students, and k is the number of True/False questions on the exam.

Each of the next n lines contains a string of length k, consisting only of upper-case 'T' and upper- case 'F'. This string represents the answers that a student submitted, in the order the questions were given.

Output

Output, on a single line, the best possible lowest score in the class.

Examples

standard input	standard output
5 4 TFTF TFFF TFTT TFFT TFTF	2
3 5 TFTFT TFTFT TFTFT	5

Problem O. Juggle

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

You are performing a magic trick with a special deck of cards.

You lay out the cards in a row from left to right, face up. Each card has a lower-case letter on it. Two cards with the same letter are indistinguishable. You select an audience member to perform an operation on the cards. You will not see what operation they perform.

The audience member can do one of two thingsthey can either select any two cards and swap them, or leave the cards untouched.

In order for the trick to succeed, you must correctly guess what the audience member dideither you guess that the audience member did nothing, or you point at the two cards the audience member swapped.

Given a string that represents the initial arrangement of the cards, can you guarantee that you will always be able to guess the audience member's operation correctly, no matter what operation they perform?

Input

The input consists of a single line containing the string s ($1 \le |s| \le 50$), which represents the initial arrangement of the cards, in the order they appear in the row. The string contains only lower-case letters ('a'-'z').

Output

Output a single line with 1 if you can guarantee that you will always be able to guess the audience member's operation correctly, or 0 otherwise.

Examples

standard input	standard output
robust	1
icpc	0

Problem P. Kindergarten

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

You are teaching kindergarten! You wrote down the numbers from 1 to n, in order, on a whiteboard. When you weren't paying attention, one of your students erased one of the numbers.

Can you tell which number your mischievous student erased?

Input

The first line of input contains a single integer n ($2 \le n \le 100$), which is the number of numbers that you wrote down. The second line of input contains a string of digits, which represents the numbers you wrote down (minus the one that has been erased). There are no spaces in this string. It is guaranteed to contain all of the numbers from 1 to n, in order, except for the single number that the student erased.

Output

Output a single integer, which is the number that the tricky student erased.

Examples

standard input	standard output
5 1235	4
10 1234568910	7
15 1234567891012131415	11

Problem Q. Minimum and Maximum Ratings

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

Your judges are preparing a problem set, and they're trying to evaluate a problem for inclusion in the set. Each judge rates the problem with an integer between -3 and 3.

The overall rating of the problem is the average of all of the judges' ratings — that is, the sum of the ratings divided by the number of judges providing a rating.

Some judges have already rated the problem. Compute the minimum and maximum possible overall rating that the problem can end up with after the other judges submit their ratings.

Input

The first line of input contains two integers n ($1 \leq n \leq 10$) and k ($0 \leq k \leq n$), where n is the total number of judges, and k is the number of judges who have already rated the problem. Each of the next k lines contains a single integer r ($-3 \leq r \leq 3$). These are the ratings of the k judges that have already rated the problem.

Output

Output two space-separated floating point numbers on a single line, which are the minimum and maximum overall rating the problem could achieve after the remaining judges rate the problem, minimum first. These values must be accurate to an absolute or relative error of 10^{-4}.

Examples

standard input	standard output
5 2 1 2	-1.2 2.4
4 4 -3 -3 -2 -3	-2.75 -2.75

Problem R. Public Mails

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

There is a group of people in an internet email message group. Messages are sent to all members of the group, and no two messages are sent at the same time.

Immediately before a person sends a message, they read all their unread messages up to that point. Each sender also reads their own message the moment it is sent. Therefore, a person's unread messages are exactly the set of messages sent after that person's last message.

Each time a message is sent, compute the total number of unread messages over all group members.

Input

The first line of input contains two integers n ($1 \le n \le 10^9$) and m ($1 \le m \le 1,000$), where n is the number of people in the group, and m is the number of messages sent. The group members are identified by number, 1 through n.

Each of the next m lines contains a single integer s ($1 \le s \le n$), which is the sender of that message. These lines are in chronological order.

Output

Output m lines, each with a single integer, indicating the total number of unread messages over all group members, immediately after each message is sent.

Examples

standard input	standard output
2 4 1 2 1 2	1 1 1 1
3 9 1 2 3 2 1 3 3 2 1	2 3 3 4 3 3 5 4 3