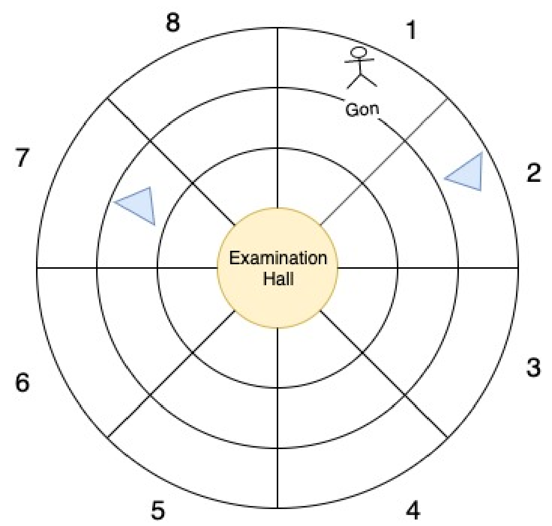
Problem A
A New Adventure

'Hunter': a licensed profession for those who specialize in finding rare creatures or secret treasures.

Gon has embarked on a new journey to become a Hunter. Yesterday, Gon arrived in Hanoi to participate in the Hunter Exam — an annual exam which an applicant must pass, in order to become a Hunter.

The Hunter Examination Hall is surrounded by a circular road. We can model the road as C concentric circles, numbered from 1 to C from the outermost circle to the innermost circle. The circles are each divided into A arcs, numbered from 1 to A in clockwise order. The j-th arc in the i-th circle is denoted by (i, j). Gon is currently standing at arc $(1, 1)$. The following image contains a circular road with $C = 3$ and $A = 8$.



There are motorbikes on the road. There is at most one motorbike in each arc, and there is no motorbike in arc $(1, 1)$. In the above image, there are 2 motorbikes, one at arc $(1, 2)$ and another at arc $(2, 7)$.

All the motorbikes are travelling at constant speed of 1 arc per second, in clockwise direction, without stopping. More precisely, if at second T, a motorbike is at (i, j), then at second $T + 1$, the motorbike will be at $(i, j \bmod N + 1)$.

Gon needs to go to the Examination Hall located inside the C-th circle. At each second, Gon can either stay at his current position, or move to an adjacent arc. Two arcs are adjacent if they share at least two points. From any arcs in the C-th circle, Gon can move to the Examination Hall.

Because Gon moves slightly faster than any motorbikes:

- If Gon moves from cell (u, v) to cell (x, y):
  - Gon will **not** be hit by motorbikes coming into cell (u, v).

  - Gon will be hit by motorbikes coming from or into cell (x, y).

- If Gon stays at cell (u, v), he will be hit by motorbikes coming into cell (u, v).

For example, in the above illustration, Gon can move as follows:

- At second 1: Gon moves to arc $(2, 1)$, the 2 motorbikes move to arc $(1, 3)$ and arc $(2, 8)$.
- At second 2: Gon moves to arc $(3, 1)$, the 2 motorbikes move to arc $(1, 4)$ and arc $(2, 1)$.
- At second 3: Gon moves to Examination Hall, the 2 motorbikes move to arc $(1, 5)$ and arc $(2, 2)$.

Note that:

- If at second 1, Gon moves to arc $(1, 2)$, he will be hit by the motorbike moving from arc $(1, 2)$ to arc $(1, 3)$.
- If at second 2, Gon stays at arc $(2, 1)$, he will also be hit by the motorbike moving from arc $(2, 8)$ to arc $(2, 1)$.

The Hunter Exam is starting soon, and Gon has not figured out how to cross the road yet. Please help him.

Input

The first line contains exactly 2 positive integers C and A. $(1 \leq C \cdot A \leq 10^5)$.

C lines follow, the i-th line contains exactly A characters representing the i-th circle. The j-th character in the i-th line can be either 'G', 'M' or '.', representing the arc where Gon stands, an arc with a motorbike, or an empty arc, respectively.

The first character of the first line is always 'G', and this is the only 'G' in the input.

Output

Print exactly one integer — the minimum time for Gon to reach the Examination Hall. If it is impossible for Gon to reach the Examination Hall, print -1.

Sample Input 1	Sample Output 1
3 8 GM...... ......M.	3

Problem B
Breaking Cake

The Hunter Exam has begun!

The first round of the Hunter Exam is a real-life problem solving test: Each candidate is given a rectangular parallelepiped cake of size $a \times b \times c$, which can be divided into unit cubes of size $1 \times 1 \times 1$.

Inside the cake, there are m unit cubes containing chocolate chips. The i-th cube is located at position (x_i, y_i, z_i).

The candidates must divide their given cake into exactly m rectangular parallelepiped parts, satisfying all the following conditions:

- For every two parts, their common space's volume must be zero.
- Each part must contain exactly one chocolate chip.
- The coordinates of the corners of all m parts must be integers.
- To prevent wasted food, candidates cannot throw away any part of the cake.

Can you divide the cake satisfying all the constraints and pass the first round of the Hunter Exam?

Input

The input contains multiple test cases. Each test case is described as below:

- The first line contains exactly 4 positive integers a, b, c and m. $(1 \leq a, b, c \leq 10^6, 1 \leq m \leq 10^3)$.
- In the next m lines, the i-th line contains exactly 3 positive integers x_i, y_i and z_i — the coordinates of the i-th chocolate chip. No two chips are in the same position. $(1 \leq x_i \leq a, 1 \leq y_i \leq b, 1 \leq z_i \leq c)$.

Sum of m over all test cases in one input file is at most 5×10^4.

The last line of the input contains a single number -1.

Output

For each test case:

- If it is impossible to divide the cake satisfying the above constraints, print exactly one line containing 'NO' .

- Otherwise, output one line containing 'YES', followed by m lines. The $i+1$-th line $(1 \leq i \leq m)$ contains exactly 6 integers, x_i, y_i, z_i, u_i, v_i and w_i representing the i-th part $(1 \leq x_i \leq u_i \leq a, 1 \leq y_i \leq v_i \leq b, 1 \leq z_i \leq w_i \leq c)$. (x_i, y_i, z_i) and (u_i, v_i, w_i) are the coordinates of two opposite unit cubes of the i-th part. The i-th part must contain the i-th chocolate chip.

Sample Input 1	Sample Output 1
5 5 5 2 1 1 1 5 5 5 5 5 5 1 3 3 3 -1	YES 1 1 1 5 5 1 1 1 2 5 5 5 YES 1 1 1 5 5 5

Problem C
Checking Break

As you already know from the previous problem, 'Breaking Cake', the first round of the Hunter Exam has begun.

The following paragraphs are copied from the problem statement of 'Breaking Cake':

> The first round of the Hunter Exam is a real-life problem solving test: Each candidate is given a rectangular parallelepiped cake of size $a \cdot b \cdot c$, which can be divided into unit cubes of size $1 \cdot 1 \cdot 1$.
>
> Inside the cake, there are m unit cubes containing chocolate chips. The i-th cube is located at position (x_i, y_i, z_i).
>
> The candidates must divide their given cake into exactly m rectangular parallelepiped parts, satisfying all the following conditions:
>
> - For every two parts, their common space's volume must be zero.
> - Each part must contain exactly one chocolate chip.
> - The coordinates of the corners of all m parts must be integers.
> - To prevent wasted food, candidates cannot throw away any part of the cake.
>
> Can you divide the cake satisfying all the constraints and pass the first round of the Hunter Exam?

This year, $10^9 + 7$ candidates participated in the first round of the Hunter Exam! Obviously, it is impossible for the Hunter Exam organizers, the Hunter Association, to manually check all the candidates' solutions. As the only programmer of the Hunter Association, you have been tasked with writing a program to automatically check whether the candidates' solutions are valid.

Input

The input contains multiple test cases. Each test case is described as below:

- The first line contains exactly 4 positive integers a, b, c and m. $(1 \le a, b, c \le 10^6, 1 \le m \le 10^3)$.
- In the next m lines, the i-th line contains exactly 3 positive integers x_i, y_i and z_i — the coordinates of the i-th chocolate chip $(1 \le x_i \le a, 1 \le y_i \le b, 1 \le z_i \le c)$. No two chips are in the same position.
- The next m lines describe a solution given by a candidate:
  - The i-th line $(1 \le i \le m)$ contains exactly 6 integers, x_i, y_i, z_i, u_i, v_i and w_i representing the i-th part $(1 \le x_i, u_i, y_i, v_i, z_i, w_i \le 10^6)$. (x_i, y_i, z_i) and (u_i, v_i, w_i) are the coordinates of two opposite unit cubes of the i-th part.

Sum of m over all test cases in one input file is at most $5 \cdot 10^4$.

The last line of the input contains a single number -1.

Output

For each test case, print exactly one line, containing 'YES' if the candidate's solution satisfies all the given constraints:

- The i-th part must contains the i-th chocolate chip.
- Candidate did not throw away any part of the cake.
- The volume of the intersection of any two parts must be equal to zero.
- $1 \le x_i \le u_i \le a, 1 \le y_i \le v_i \le b, 1 \le z_i \le w_i \le c$.

Otherwise, print 'NO'.

Note that it is **not** guaranteed that the cake can be divided into m parts satisfying all the given constraints. In which case, the output for that test case would be 'NO'.

Sample Input 1

```
5 5 5 2
1 1 1
5 5 5
1 1 1 5 5 1
1 1 2 5 5 5
5 5 5 1
3 3 3
1 1 1 5 5 6
-1
```

Sample Output 1

```
YES
NO
```

Problem D
Dropping Ball

In the second round of the Hunter Exam, the candidates are faced with an even more challenging problem, requiring both agility and mathematical skills.

After entering the Examination Hall for the second round, candidates are faced with a huge vertical grid containing empty spaces, obstacles and conveyor belts. The grid is composed of K identical parts, each of size $(R+1) \times C$, stacking vertically on top of each other. In order to pass the exam, each candidate must drop exactly one ball into this grid and get the maximum possible score.

Below is a sample grid with $R = 2$, $C = 5$ and $K = 2$:

R			?	
L				
100	100	7	100	8
R			?	
L				
100	100	7	100	8

Each cell in the grid can be one of the following:

- Empty space (colored white in the above image). The ball falls through it.
- Obstacle blocking the ball from moving (colored black in the above image). If the ball lands on top of an obstacle, it cannot go anywhere and the exam ends.
- Conveyor belt (colored yellow in the above image). All conveyor belts are horizontal and have either left or right direction. Some belts' direction have been fixed, and you have to set the direction for the others. Based on its direction, a belt sends the ball one unit to the left or to the right. If the ball is sent outside of the grid or to an obstacle, your exam ends immediately.
  - In the above grid, 'R' and 'L' represent a conveyor bell which was already set to right and left, respectively, and '?' represents a conveyor bell which is not yet set.
  - Note that two belts in two different parts are considered different. You can set different directions for them, even though they are in the same position in respect to their parts.

- Cell with points (colored blue in the above image). A cell belongs to this kind if and only if it is on the last row of some part. This cell contains an integer — the score you gain when the ball lands on this cell. Note that the ball will fall through this square and begins a new part, or if that's the last part, the exam ends.

As the time for the exam is limited, the exam will also end when the ball goes through 10^{20} cells.

Your final score in this exam is the sum of score you get when the exam ends. You don't have to make the ball fall to the bottom. To pass the exam, you must find a way to set the conveyor belts and set the initial position of the ball to maximize the final score. Can you do it?

Input

The first line of the input contains 3 integers R, C and K. $(1 \leq R, C \leq 50, 1 \leq K \leq 10^9)$.

In the next R line, the i-th line contains exactly C characters. Each character can be one of the following:

- '.', representing an empty space.
- 'X', representing an obstacle.
- 'R', representing a conveyor belt, which is already set to right.
- 'L', representing a conveyor belt, which is already set to left.
- '?', representing a conveyor belt, which is not yet set.

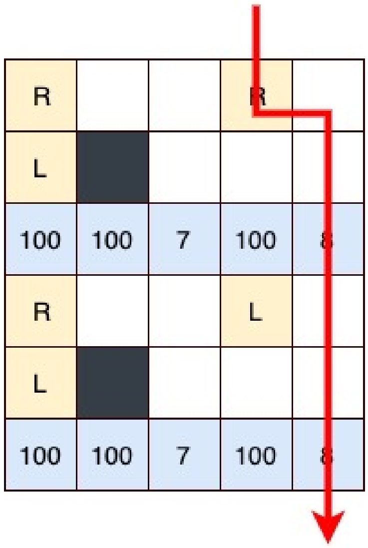
The last line of the input contains exactly C integers. The i-th number, a_i, represents the score in the i-th column in the last row. $(1 \leq a_i \leq 10^9)$.

Output

Output contains a single integer — the maximum final score.

Explanation for the first example

We can set the conveyor belt in the first row to 'R' and the conveyor belt in the 4th row to 'L', then drop the ball from the 4-th column.



Sample Input 1	Sample Output 1
2 5 2 R..?. .X... 100 100 7 100 8	16

Sample Input 2	Sample Output 2
2 3 1 X.. .?. 10 1000 1	10

Sample Input 3	Sample Output 3
2 3 100 X.. .?. 10 1000 1	100

Problem E
Easy Probability

As a Hunter, you will undoubtedly face difficult obstacles during your journey. At such time, a Hunter is expected to model the situation using Mathematical models, and apply probability and statistics knowledge to overcome the situation.

Thus, the third round of the Hunter Exam is based on the following game with coins:

- Before the game starts, Gon selects a string g and Killua selects a string k. The two strings must contain only characters 'H' and 'T'.
- A game master will flip a coin an infinite number of times. After each flip, the result (either 'H' or 'T' — representing head or tail) is appended into a string s.
- After some coin flip:
  - If both g and k become a substring of s, the game ends in a draw.
  - If only g becomes a substring of s, Gon wins, and the game ends.
  - If only k becomes a substring of s, Killua wins, and the game ends.
- Gon and Killua only have finite amount of time. They will stop the game in a draw after 10^{100} turns.

Please calculate the probability that Gon wins.

Input

The input contains exactly three lines:

- The first line contains the string g.
- The second line contains the string k.
- The third line contains a real number p with exactly one digit after the decimal point — the probability that a coin flip will result in head $(0 < p < 1)$.

The length of g and k are at most 20. g and k are non-empty, and contain only characters 'H' and 'T'.

Output

The output must contain a single integer — the probability that Gon wins.

Your answer will be considered correct if its relative or absolute error doesn't exceed 10^{-6}.

Namely: let's assume that your answer is a, and the answer of the jury is b. The checker program will consider your answer correct, if $\frac{|a-b|}{max(1,b)} \leq 10^{-6}$.

Sample Input 1	Sample Output 1
H T 0.5	0.5

Sample Input 2	Sample Output 2
HH TH 0.5	0.25

Problem F
Final Exam

In the final round of the Hunter Exam, candidates must prove their ability to process big data as well as geometry knowledge.

In the Examination Hall, the candidates can find three piles of segments:

- The first pile has n_a segments, and the i-th segment has length A_i.
- The second pile has n_b segments, and the j-th segment has length B_j.
- The third pile has n_c segments, and the k-th segment has length C_k.

The candidates must quickly select three segments, one segment from each pile, such that:

- The three segments can be used to form a **right triangle**.
- The segment chosen from the third pile must be longest.

As the organizer of the Hunter Exam, you need to make sure that the difficulty is right for the final round. Thus you want to know the number of ways to select three segments, satisfying the conditions above?

Input

The first line of the input contains exactly three integers: n_a, n_b and n_c ($1 \leq n_a, n_b, n_c \leq 3 \cdot 10^5$).

The second line of the input contains exactly n_a integers — the lengths of the segments in the first pile.

The third line of the input contains exactly n_b integers — the lengths of the segments in the second pile.

The fourth line of the input contains exactly n_c integers — the lengths of the segments in the third pile.

All the lengths of the segments are between 1 and $3 \cdot 10^7$, inclusive.

Output

Print exactly one integer — the number of triplets.

Explanation of sample test

There are 4 different ways to select three segments: $(3, 4, 5)$, $(3, 4, 5)$, $(4, 3, 5)$ and $(4, 3, 5)$.

Selecting $(5, 4, 3)$ is not valid, as the segment from the third pile must be the longest segment.

Sample Input 1	Sample Output 1
3 2 3 3 4 5 4 3 5 5 3	4

Problem G
Gathering in Yorknew

Hunters from all over the world are gathering in Yorknew — where the 'International Hunter Programming Contest 2020' will take place. As Gon has previously passed the final round of Hunter Exam and became a Hunter, you may be able to see Gon in Yorknew!

There is exactly one road leading to Yorknew — an infinitely long and narrow road. For simplicity, you can imagine the road as a straight line.

h Hunters are going to Yorknew city. The i-th Hunter is currently at location x_i. Yorknew city is at location 0. The Hunters all walk very fast — they move with velocity of 1 unit per second.

To avoid traffic jam, Yorknew city administrators have decided to build two portals. It takes exactly 0 second to teleport from one portal to the other.

The administrators want to place the two portals at some integer positions on the road, such that the total time it takes for all h Hunter to reach Yorknew city is as small as possible.

Input

The first line of the input contains exactly one integer h — the number of Hunters $(1 \leq h \leq 10^5)$.

The second line contains exactly h integers: the i-th number, x_i is the current location of the i-th Hunter. $(-10^9 \leq x_i \leq 10^9)$.

Output

Print only one integer — the total time it takes for all Hunters to reach Yorknew city.

Explanation of sample test

There are 3 Hunters, at locations 4, 5 and 6. An optimal plan is to place two portals at 0 and 5.

The time it takes for the 3 Hunters to reach Yorknew city are: 1, 0 and 1. Thus, the total time is $1 + 0 + 1 = 2$.

Sample Input 1	Sample Output 1
3 4 5 6	2

Problem H
Hunter x Communication

Having passed the Hunter Exam, Gon is now officially a Hunter! Gon is now saying goodbye to his best friend, Killua, as Gon wants to visit his home in 'While Island'.

Gon and Killua plan to use the online chat application, Olaz, to keep in touch. However, they are not confident with Olaz's security: some imposters may be able to login to Gon's account and send messages to Killua! To prevent this, they have decided to use the following method:

- Before starting a conversation, Gon must send Killua a number X with exactly n digits.
- Killua must reply with an integer Y with exactly n digits, where X and Y form a **best friend pair**.
- Each time they start a conversation, they must use a different **best friend pair**. This would avoid imposters from simply reusing the previous best friend pairs.

To define a best friend pair, first we define a friendly operation on a number X as follow:

- Select two adjacent digits of X.
- Either add 1 to both digits, or subtract 1 from both digits.
- It is forbidden to add 1 to digit 9, or subtract 1 from digit 0.
- It is also forbidden to subtract 1 from the first digit of X, if the first digit of X is 1.

Note that the last two conditions guarantee that the new number is valid and does not have leading zero. The new and old numbers will also have the same length.

Two numbers X and Y are called best friends, if we can obtain Y from X, by applying a finite number of friendly operations. Note that a number X is best friend with itself.

For example, 666 and 875 are best friends because we can apply the operations as follow:

- $666 \to 776$
- $776 \to 886$
- $886 \to 875$

Now Gon is wondering how many conversation can they have, before running out of best friend pairs.

Input

The input contains exactly one integer n $(1 \le n \le 10^5)$.

Output

The output contains exactly one integer — the number of pairs of best friend numbers with exactly n digits, modulo $998\,244\,353$.

Sample Input 1	Sample Output 1
`1`	`10`

Sample Input 2	Sample Output 2
`2`	`570`

Problem I
IMO Harder Problem

After passing the final round of the Hunter Exam, Gon is now a Hunter! But before continuing his exciting journey, Gon decides to visit his home in 'While Island'.

Aunt Mito is happy that Gon has become a Hunter and has visited home. But at the same time, she feels worried about Gon — the life of a Hunter is challenging. Thus, she will not allow Gon to leave 'While Island', unless Gon is able to solve a puzzle prepared by aunt Mito.

But what puzzle should Mito give to Gon? Mito opened 'IMO 2019 Problems' and found the following problem:

> The Bank of Bath issues coins with an H on one side and a T on the other. Prof. Tuy has n of these coins arranged in a line from left to right. He repeatedly performs the following operation: if there are exactly $k > 0$ coins showing H, then he turns over the k-th coin from the left; otherwise, all coins show T and he stops. For example, if $n = 3$ the process starting with the configuration THT would be: $THT \rightarrow HHT \rightarrow HTT \rightarrow TTT$, which stops after three operations.
>
> Show that, for each initial configuration, Prof. Tuy stops after a finite number of operations.

'This problem is too easy' — Mito thought. 'Gon will be able to solve it in no time'.

After some more thinking, Mito changed the above problem to the following harder version:

> For each initial configuration C, let $L(C)$ be the number of operations before Prof. Tuy stops.
>
> Given a sequence S consisting of H, T and $?$, representing some initial state, where $?$ denotes an unknown state. Calculate the average value of $L(C)$ over all possible sequences C represented by S.

Even though Gon is smart, he is still unable to solve this question. Please help Gon!

Input

The input contains a single non-empty line with at most 10^6 characters — the sequence S.

Output

The output must contain a single number — the average value of $L(C)$, as explained in the statement.

Your answer will be considered correct if its relative or absolute error doesn't exceed 10^{-6}.

Namely: let's assume that your answer is a, and the answer of the jury is b. The checker program will consider your answer correct, if $\frac{|a-b|}{max(1,b)} \leq 10^{-6}$.

Sample Input 1	Sample Output 1
HH	2.0

Sample Input 2	Sample Output 2
`H?`	`1.5`

Sample Input 3	Sample Output 3
`??`	`1.5`

Problem J
Just Enough Bridges

Chimera Ant is an intelligent and hard-working species.

There is a colony of n Chimera Ants living near Han River in Danang, Vietnam. They have built n houses (one house for one ant) on one side of Han River, and n feeding grounds on the other side of Han River. The houses are numbered from 1 to n, and the feeding grounds are also numbered from 1 to n.

The ants have also built m bridges across Han River $(m \geq n)$, each bridge connects one house to one feeding ground. It is possible that there are more than one bridge connecting a house and a feeding ground.

Every morning, the n ants select n bridges, to go to from their houses to their feeding grounds.

The bridges were built in such a way that it is possible for the ants to go directly to all n feeding grounds. In other words, there exist a permutation P of all integers from 1 to n, such that there exists a bridge connecting the i-th house with the P_i-th feeding ground.

The ants feel that they have built too many bridges. Thus they want to remove exactly one bridge, so that the above condition is still true.

Even though the Chimera Ants are very intelligent, they are not good with numbers. Please help the ants figure out how many different bridges they can remove.

Input

The first line of the input contains two integers n and m $(1 \leq n \leq m \leq 10^5)$.

Each of the next m lines contains two integers u and v $(1 \leq u, v \leq n)$ — indicating that there is a bridge between the u-th house and the v-th feeding ground.

Output

The number of bridges satisfying the given conditions.

Sample Input 1	Sample Output 1
2 3 1 1 1 2 2 2	1

Problem K
Kingdom of Ants

The Chimera Ants are building their own kingdom!

There are n ants numbered from 1 to n. Each ant is responsible for kingdom construction in a rectangular region. More precisely, the i-th ant is assigned a rectangular region in Cartesian plane, with edges parallel to the two axes, and opposite corners at (x_i, y_i) and (u_i, v_i).

Some regions or parts of some regions might be assigned to multiple ants. Usually, this would pose no problem: when two ants disagree, all the ants assigned to this region will vote for the two options, and the option with more votes will be implemented. However, this method does not work if a non-zero, even number of ants are assigned to a region, as the voting result may be a tie. The ants would like to know what are the total area of such region. Please help them!

Input

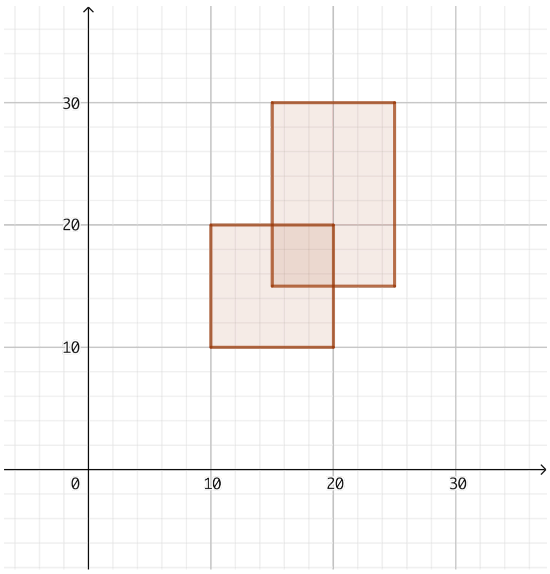
The first line of input contains a single integer n $(1 \le n \le 10^5)$.

In the next n line, the i-th line contains 4 integers, x_i, y_i, u_i and v_i $(-10^9 \le x_i, y_i, u_i, v_i \le 10^9)$. (x_i, y_i) and (u_i, v_i) are the coordinates of the two opposite corners of the rectangular region assigned to the i-th ant.

Output

Print a single integer — the total area assigned to a positive even number of ants.

Explanation of sample test



Sample Input 1	Sample Output 1
2 10 10 20 20 15 15 25 30	25

Problem L
Learning to code

In the 21st century, Hunters are expected to master programming languages, in order to effectively gather information on the Internet.

Gon is currently learning NenScript — the most popular programming language amongst Hunters.

Today, Gon is learning variables. In NenScript, a variable always stores a string of zero or more characters, each character is any of the following: lowercase and uppercase English letters, digits, space and special characters: **!@#$%^&*()-_=+**. In this problem, we call these characters *good characters*. The name of every variable only consists of lowercase English letters, and underscore (_). The length of a variable name is **between** 1 **and** 10, inclusive.

In order to use a variable, first we need to declare it. The syntax of the declaration is as below:

```
var <name> = <value>;
```

Here <name> is the name of the variable you want to declare, and <value> is an **expression** which denotes the string assigned to this variable. There are 3 types of expression in NenScript:

- **Variable name**, which means that the value equals to some previously declared variable.
- **String literal**, which explicitly states the value by putting its sequence of characters in quotes.
- **Template literal**, which allows you to create a string based on values of other variables by embedding expressions.

In a template literal, embedded expressions are calculated, then concatented with other parts to create a string. Template literals are enclosed by back-tick (`) and contain several (possibly zero) string expressions. String expressions are put inside curly braces following a dollar sign (${expression}). In other words, a template literal is an expression of the form `$S_1\$\{E_1\}S_2\$\{E_2\}\ldots S_n\$\{E_n\}S_{n+1}$`, where $n \geq 0$. For every valid i, S_i is a string consisting of zero or more *good characters*, and E_i is an **expression**.

Let's take an example:

```
var a = "Gon";
var b = a;
var c = `My name is ${a}`;
```

Here, the values of a, b and c are "Gon", "Gon" and "My name is Gon", respectively. Note that quotes are for clarity only, no vairable's value contains any quotes.

Template literals can be nested, in other words, there can be a template literal inside a template literal. For example:

```
var a = "Gon";
var b = `My name ${`is ${a}`}`;
```

In this example, “ ‘is ${a}‘ ”, whose value is “is Gon”, acts as an embedded expression of the template literal assigned to variable b. The value of b is “My name is Gon”.

Your task is to read a sequence of commands in NenScript, each of them is either a variable declaration, as explained above; or a print request, which is in the following form, where <expr> is an expression:

```
print <expr>;
```

For each print request, print the value of the given expression.

Input

The input consists of several lines, each is either a variable declaration or a print request, as explained above. It is guaranteed all variables are neither declared twice, nor used before being declared. The input is terminated by a line with exactly one word “end.”. The total length of all lines does not exceed 10^4.

Output

For each print request, print on a separate line the value of the corresponding expression. It is guaranteed that you have to print at least 1 and at most 10^4 characters. Please be aware that we use the **case sensitive** and **space change sensitive** checker.

Sample Input 1

```
var a = "Gon";
var b = a;
var c = `My name is ${a}`;
print c;
print `My name is ${b}`;
end.
```

Sample Output 1

```
My name is Gon
My name is Gon
```

Sample Input 2

```
var one = "1";
var two = "2";
var three = "3";
print `${one} + ${two} = ${three}`;
print `1${`2${three}2`}1`;
end.
```

Sample Output 2

```
1 + 2 = 3
12321
```