Arya and Margaret get to know each other

Problem ID: aryaknow

Arya and Margaret met at a programming contest. In order to know each other better, they began to discuss their favorite algorithms. Arya made a list of x algorithms, while Margaret's list has y algorithms.

They decided to take turns to discuss every algorithm on their list. For example, if Ayra starts first, she might tell Margaret about the Dijkstra algorithm for shortest paths. Then Margaret might explain the John Hopcroft algorithm for maximum weight bipartite matching. After that, Arya might talk about the Ford-Fulkerson algorithm for maximum flow, and so on. (Yes, they share a common interest in graph algorithms!)

They will continue in this fashion until it's a person's turn, but she doesn't have any more algorithms on her list. This person will then think of something else, such as the P versus NP problem.

Can you help figure out who will be this person?

Input

The input contains a single line containing two integers: x and y ($0 \leq x \leq 10^9$ and $0 \leq y \leq 10^9$).

Output

The output should contain a single line with either "Depends on who starts", "Arya will think of something else" or "Margaret will think of something else".

Sample Input 1	Sample Output 1
3 3	Depends on who starts

Sample Input 2	Sample Output 2
1 1000000	Arya will think of something else

Sample Input 3	Sample Output 3
42 15	Margaret will think of something else

Monarch or Viceroy

Problem ID: yubutterfly

Yu is an assiduous lepidopterist (one who studies butterflies) and her friends often ask her for help identifying the butterflies they see.

One of the most common requests is to differentiate two very similar butterfly species: *monarch* and *viceroy*.

The distinctive difference between the two is that viceroy butterflies have a black stripe across their hind wings, while monarch butterflies don't.

This request is so common for her that she would like your help. Can you create a program that identifies a butterfly as either monarch or viceroy?

Monarch (left) and viceroy (right) butterflies

Input

The input contains a single line with the description of the butterfly's hind wing. It will be either "Has a stripe" or "Does not have a stripe".

Output

Output a single line with either "Monarch" or "Viceroy" depending on which butterfly it is.

Sample Input 1	Sample Output 1
`Has a stripe`	`Viceroy`

Sample Input 2	Sample Output 2
`Does not have a stripe`	`Monarch`

I Want to be a Queen and a Knight

Problem ID: alicechess

Alice climbed through a magical mirror and fell onto a giant chessboard. To her surprise, she couldn't move out of her square!

Suddenly, a voice boomed, "Who do you want to be?"

Alice thought she might want to be a queen, so she shouted, "I want to be a queen!"

The voice replied, "Then you shall be a queen!"

Alice found herself no longer trapped in her square. Instead, she could freely travel to any square on the same row, column, or diagonal.

But that soon became boring so Alice changed her mind and shouted, "I want to be a knight!"

The voice replied, "Then you shall be a knight!"

Alice could now jump to any square that is two squares away vertically and then one square away horizontally, or two squares away horizontally and then one square away vertically.

But that became boring too and Alice came up with something interesting this time. She said, "I want to be a queen and a knight!"

The voice replied, "Then you shall be a queen and a knight"!

Alice wasn't sure how that worked out and she was surprised to find that she could travel as either a queen or a knight this time.

Just as Alice was pondering who she wants to be next, a door popped out of nowhere on the chessboard. Could you help Alice reach the door by telling her whether she could reach the door in one move as a knight and a queen?

Input

The input contains a single line with four integers: $x1$, $y1$, $x2$, and $y2$, $0 \leq x1, y1, x2, y2 \leq 7$. Alice is currently at square $(x1, y1)$ and the door is at square $(x2, y2)$. It is guaranteed that $(x1, y1) \neq (x2, y2)$.

Output

Output "YES" (without quotes) if Alice could reach the door in one move as a queen and a knight or "NO" otherwise.

Sample Input 1	Sample Output 1
1 1 5 1	YES

Sample Input 2	Sample Output 2
4 5 5 7	YES

Sample Input 3	Sample Output 3
7 7 6 4	NO

Just Guitar
Problem ID: kyokorhythm

Kyoko is a girl who loves music and dancing. She is playing a brand new rhythm game called "Just Guitar". In this game, the player plays an imaginary guitar and gains style points based on their performance.

Kyoko just played a song that has a sequence of n notes in it. For each note, Kyoko gets either "Perfect", "Great", or "Miss". Each "Perfect" counts as 100 points; each "Great" as 50 points; and each "Miss" as 0 points.

Kyoko also earns combo bonuses for getting "Perfect" or "Great" consecutively. The game has a combo counter that starts at 0 at the beginning of a song. For each "Perfect" or "Great" note, Kyoko gets a combo bonus equal to the current combo counter, and then the counter is increased by one. But any "Miss" does not earn combo bonuses and resets the counter to 0.

Given a record of Kyoko's performance, can you calculate the final score for her?

Input

The input contains two lines. The first line contains an integer n ($1 \leq n \leq 1000$), how many notes are there in the song. The second line contains a string of length n, where each character can only be "*", "o" (lowercase, as in orange), or "x" (lowercase, as in exceed), correspond to "Perfect", "Great", and "Miss" respectively.

Output

Output a single integer which is Kyoko's final score.

Sample Input 1	Sample Output 1
5 *****	510

Sample Input 2	Sample Output 2
5 **xoo	302

Sample Input 3	Sample Output 3
10 *o*o*o**xo	728

Rebuild blockchain
Problem ID: eveblockchain

Blockchains are used more and more in the world, with their most popular uses being Cryptocurrencies and Smart Contracts.

Eve was in charge of keeping a blockchain in order but there has been a failure in the system and now the blocks are all shuffled!

For the purpose of this problem, a blockchain is, as the name suggests, a chain of blocks, where a block has a unique identifier attached to it (called a "hash").

A block stores, among other things, its own hash and the hash of its predecessor (i.e., the block that comes immediately before it in the chain). The first block of the chain, also called the "genesis block" doesn't have a predecessor.

For each block, you know its hash and its predecessor's hash. Can you help Eve recover the original order of the blocks?

For example, if you know that the existing blocks are $(1F, 4A2)$, $(4A2, NULL)$, and $(1AC2F9, 1F)$ (where a block (a, b) means that its own hash is a and the hash of its predecessor is b), then the correct order has to be $42A, 1F, 1AC2F9$, because the predecessor of $1F$ is $42A$, and the predecessor of $1AC2F9$ is $1F$.

Input

The input starts with a line containing a single integer N ($1 \leq N \leq 10^5$).

The following N lines contain 2 words each, the node's own hash, and its predecessor's hash. The lines are given in random order.

Each of the two words is either NULL (indicating the genesis block, which doesn't have a predecessor) or a sequence of at least 1 and up to 40 characters, each one being a digit or a letter between "A" and "F".

It is guaranteed that no two blocks have the same hashes and that it is possible to recover the original order of the blockchain.

Output

The output should contain N lines with the hashes of the blocks in their correct order (starting from the genesis block).

Sample Input 1

```
3
1F 4A2
4A2 NULL
1AC2F9 1F
```

Sample Output 1

```
4A2
1F
1AC2F9
```

Sample Input 2

```
5
2 1
5 4
3 2
1 NULL
4 3
```

Sample Output 2

```
1
2
3
4
5
```

Ada Lovelace and Babbage Engines

Problem ID: adagears

Ada Lovelace (1815-1852) is widely celebrated as one of the first computer programmers in history. She created programs for a purely mechanical and even theoretical machine called the *Babbage Engine*.

Ada is away on a trip with her parents and left you behind to analyze a particular program she wrote for the machine.

As part of the program, there is a collection of gears, and some pairs of them are connected. When two gears are connected, and one of them is forced to turn clockwise, the other would be forced to turn counterclockwise, and vice-versa. In case a gear is forced to turn in both directions, the machine breaks.

Your job is to predict what will happen if a gear is forced to turn clockwise.

Input

The input starts with a line containing two integers N and M ($1 \leq N \leq 10^5$ and $0 \leq M \leq 10^5$), the number of gears, and the number of connections, respectively. Gears are numbered from 1 to N.

The next M lines will contain two integers each a and b stating that gear a is connected to gear b ($1 \leq a, b \leq N$ and $a \neq b$).

It is guaranteed that the same pair of gears is never connected more than once.

Output

Your output should start with a single line. This will be either "Help me Ada", in case the machine would break when gear 1 is forced to turn clockwise (see the examples below), or "OK", in case the machine would run smoothly.

If the answer is "OK", the following N lines should have one word each, describing what will happen with each of the gears (in order). The descriptions can be either "CW" if the gear will be turning clockwise, "CCW" if the gear will be turning counterclockwise, or "ST" if the gear won't be moving.

Sample Input 1

```
2 1
1 2
```

Sample Output 1

```
OK
CW
CCW
```

Sample Input 2

```
3 1
1 2
```

Sample Output 2

```
OK
CW
CCW
ST
```

Sample Input 3

```
3 3
1 2
2 3
3 1
```

Sample Output 3

```
Help me Ada
```

Grace in Space

Problem ID: gracespace

It's the year 2051. Grace, the most advanced spaceship ever built, is sailing across the vast universe from one galaxy to another with its Hopper engine.

The Hopper engine has a unique way of operation. It first needs to be charged for some time and then, by releasing the stored energy, it instantly teleports the spaceship forward and "hops" to the destination. If the charge time is t microseconds, then the ship will hop $at^5 + bt^3 + ct$ light-years for some positive coefficient a, b, and c.

Remembering that rover Perseverance landed in Jezero Crater 30 years ago, which took about 7 months just to travel from Earth to Mars, you wonder how much time it would take for Grace to reach Mars from your current location. Given the distance d in light-years, can you calculate the time t needed to charge the Hopper engine in microseconds?

Input

The input contains a single line contains four real numbers a, b, c, and d. $1 \leq a, b, c \leq 100$, $1 \leq d \leq 10^9$. Up to 4 digits after the decimal.

Output

Output a single real number, the time needed to hop to Mars. Round-up to 7 digits after the decimal.

Sample Input 1	Sample Output 1
1.0 1.0 1.0 3.0	1.000000

Sample Input 2	Sample Output 2
3.14 15.9 26.5 358979.3	10.172151

Sophie's World of Balance

Problem ID: sophieworld

Sophie recently became interested in philosophy and learned about idealism and utilitarianism. As an adventurous young philosopher, she decided to mix those two and build her own realm of philosophy. She came up with the following problem:

In her world of ideas, there are a total of $2n + 6$ ideas. Each idea is associated with a utility value. Sophie shall pair each idea with another idea, and the imbalance caused by such a pair would be the difference between their utility values.

However, Sophie does not think her world should be binary, so she decided to create exactly two idea triples (with three ideas each). The imbalance caused by such a triple would be the difference between the largest utility value and the smallest utility value in the triple.

For instance, suppose that there are 8 ideas (so $n = 1$) with utility $1, 2, 3, 4, 5, 6, 7, 8$. Consider these possible arrangements:

- groups: $[5, 6, 7]$, $[1, 2, 4]$, and $[3, 8]$. The total imbalance of this arrangement is $(7-5)+(4-1)+(8-3) = 10$.
- groups: $[1, 2, 3]$, $[6, 7, 8]$, and $[4, 5]$. The total imbalance of this arrangement is $(3-1)+(8-6)+(5-4) = 5$.

Sophie wants to make sure the world is as balanced as possible, so the second arrangement is better. And it turns out that it is also the best in this case!

Can you help Sophie solve the problem for her emerging philosophy?

Input

The first line of input contains a single integer n ($1 \leq n \leq 10^5$). The second line contains $2n + 6$ integers separated by spaces representing the utility of ideas. Each number is between 1 and 10^9.

Output

The output should contain a single line with a single integer: the smallest possible imbalance value for an arrangement of these ideas into two triples and n pairs.

Sample Input 1	Sample Output 1
1 1 2 3 4 5 6 7 8	5

Sample Input 2	Sample Output 2
2 1 1 1 1 1 1 1 1 1 1	0

Sample Input 3	Sample Output 3
2 10 1 3 5 25 2 3 1 42 10	20