Ladder problems

Rules: the ladder problems are divided into blocks by difficulty. Each subsequent block is available for solving only after all previous blocks were completed and reviewed by the TA.

Difficulty: easy

Expected solution percentage: 100%

Problem 1. A + B

Given two numbers, add them up and print the result

Input format:

two numbers, *a* and *b*, both on the same line ($-2^{16} <= a, b <= 2^{16}$)

Output format:

single number, the sum of *a* and *b*.

Sample:

Input	Output
2 3	5

Problem 2. Elections

The country is on the edge of grand change - the elections for the new president are taking place! Too bad the system isn't durable enough to withstand more than 3 votes, so it is now up to you to develop a new one and save the image of the country.
m candidates are available for election and *n* citizens have decided to participate. Which candidate will be the new president?

Input format:

On the first line there are two numbers: *n* and *m* ($1 <= n, m <= 1024$). After that, on the *n* subsequent lines there are numbers a_i ($1 <= a_i <= m$) - the votes of candidates.

Output format:

The number of the winning candidate. It is guaranteed that there are no draws in the election.

Sample:

Input	Output
5 3 1 1 2 3 1	1

Difficulty: medium

Expected solution percentage: 85%

Problem 1. Validating Inputs

Write a program that prompts for a first name, last name, employee ID, and ZIP code. Ensure that the input is valid according to these rules:

- The first name must be filled in.
- The last name must be filled in.
- The first and last names must be at least two characters long.
- An employee ID is in the format AA-1234. So, two letters, a hyphen, and four numbers.
- The ZIP code must be a number.

Note:
Display appropriate error messages on incorrect data.
Create a function for each type of validation.
Repeat the process if the input is not valid.

Sample Input/Output

Enter the first name: J Enter the last name: Enter the ZIP code: ABCDE Enter an employee ID: A12-1234 "J" is not a valid first name. It is too short. The last name must be filled in. The ZIP code must be numeric. A12-1234 is not a valid ID.	Enter the first name: Jimmy Enter the last name: James Enter the ZIP code: 55555 Enter an employee ID: TK-421 There were no errors found.

Problem 2. Tough exam

Vasya has a history exam, though to say that he did not prepare would be an understatement. He has made cheat cards for all *n* questions of the exam, so his pocket is full of papers. The need to quickly take out the right card is high - the teacher won't hesitate to take him to the principal!

Input format:

On the first line there is a number *n* - the amount of questions on the exam (1 <= *n* <= 10^9). On the next *n* lines are the cheat cards in the following format: "`question:answer`". On the *n+1*-th line there is the question that Vasya is facing.

Output format:

Print the answer to the question.

Sample:

Input	Output
3 World War 2:1939 Current Russian President:Putin Country above USA:Canada World War 2	1939

Difficulty: hard

Expected solution percentage: 60%

Problem 1. Frequency Analysis

Tom is heavily into cryptography - all after reading Allan Poe's breathtaking books! His friend challenged him to break her cipher, which she thinks is uncrackable. Without much hesitation, Tom decided to use the frequency analysis technique. He's a little lazy though, so he wants the computer to do it for him.

Input format:

The only line of input contains the encrypted sentence (containing only lowercase latin letters and spaces)

Output format:

Print the 2 most common letters of the sentence and the percentage that these letters cover. Spaces should not be counted.

If there are several letters competing for the same place, print any of them.

Sample:

Input	Output
Hello World	l 27.27272727272727% o 18.181818181818183%

Difficulty: extreme

Expected solution percentage: 30%

Problem 1. Relatives

Relatives are a great thing! But they can also be hard to keep track of at times. Polina is at a family gathering and she sees someone that could be her cousin, but she's not sure. That person is named Max - that she is certain about. She asked around, but no one was able to give her a comprehensive answer. The answers are all there - think you could find the answer?

The "relatives" relation is transitive: if A and B are relatives, and B and C are relatives, then A and C are relatives.

Input format:

On the first line there's a number *n* - the amount of answers Polina got. On the next *n* lines there are two names, space separated. Names only consist of English letters. The two names on a single line are relatives. All names are guaranteed to be unique.

Output format:

If the answers are enough to say that Max is a relative of Polina, print "`He is!`". Otherwise, print "`idk`".

Sample:

Input	Output
4 Polina Bill Mary Bill Max Jake Jake Mary	He is!
2 Polina Bill	idk

Jake Mary	

Problem 2. Frequency Analysis Advanced

Remember Frequency Analysis? Tom has successfully cracked the cipher, but the battle is far from over. His friend thinks that he only cracked it because the encrypted sentence was “Hello World” and that his technique will fail on bigger, more unexpected texts. And this time she has encrypted an entire book, so analysing it by hand is not an option.

Input format:

The only line of input contains the name of the file which stores the encrypted book. Open the file and go from there. The text might contain other characters apart from Latin letters, they should be ignored.

Output format:

Print the **3** most common letters of the text in the file and the percentage that these letters cover, rounded to three digits after the dot.

If there are several letters competing for the same place, print any of them.

Sample:

Input	Output
book.txt	e 13.333% t 8.772% n 7.719%

Explanation:

In the sample test case, the “book.txt” file contained the problem statement:

Remember Frequency Analysis? Tom has successfully cracked the cipher, but the battle is far from over. His friend thinks that he only cracked it because the encrypted sentence was “Hello World” and that his technique will fail on bigger, more unexpected texts. And this time she has encrypted an entire book, so analysing it by hand is not an option.