Problem A. JQ

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

JSON (Javascript Object Notation) is one of the most widely popular data transfer formats on the web, it's simple and intuitive to parse, lightweight (as opposed to XML), and Human-readable (as opposed to Protocol Buffers or Thrift).

If you've never dealt with JSON before, the format is pretty simple:

- Data is in name/value pairs
- Data is separated by commas
- Curly braces hold objects
- Square brackets hold arrays

For the purposes of this problem, JSON objects given to you won't contain spaces and won't contain null or boolean values, all the numbers are going to be integers $\leq 10^5$.

See link: https://www.json.org/json-en.html and examples for more details.

In this problem, you are tasked with writing a debugging tool, that given a JSON object it can extract meaningful information with the help of JSONPath (Note: this tool is known as jq).

We will only be using a small subset of the original JSON Path notation, namely:

- $: refers to the root object
- .property: accesses the property named "property"

index : accesses the array value at index "index"

Example:

Let's suppose we have the following JSON object:

```
{
  "store": {
    "book": [
      {
        "category": "craftmanship",
        "author": "Robert C Martin",
        "title": "Clean Code",
        "price": 27.95
      },
       {
        "category": "none-fiction",
        "author": "Chris Fenning",
        "title": "The first minute",
        "price": 12.99
      }
    ],
   "address": "21 B baker street"
 }
}
```

Here are example query answers:

- $.store.books[0].category => "craftmanship"
- $.address => "21 B baker street"
- $.book[0] => "category": "craftmanship "author": "Robert C Martin "title": "Clean Code "price": 27.95
- $.book[4] => None

Input

First-line contains a JSON formatted string S where $2 \leq S \leq 10^5$.

Second-line contains a number Q, the number of JSON path query strings where $1 \leq Q \leq 10^4$.

Q lines follow contain each a JSON Path P where: $1 \leq P \leq 100$.

Output

For each one of the Q queries, output the value at the JSON path specified (as given in the statement, no spaces, and in the same key order), or *None* if no key exist at the given path.

Examples

standard input	standard output
{"a":"b","c":{"a":1}} 2 $.a.a $.c.a	None 1
["a","2",{"key":"value"}] 1 $.a	None
{"a":"b","c":2} 3 $.a $.c $.hello	"b" 2 None
{"hello":"world","key":{"value":12}} 2 $.test $.key	None {"value":12}

Note

The output objects should always be displayed in the same key-order they were given in

Problem B. Doha's Colors

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Doha is a talented artist. She is obsessed with trying different combinations of colors in her artwork. This time she needs your help since as you know there are millions of different colors and their combination sometimes would be hard to predict.

You are given two palettes P_a and P_b containing different colors. You are asked to answer Q queries where each query is represented as a combination color c. You need to print the count of pairs that if we select any color from P_a and we combine it with any P_b results in c.

Input

The first line has three integers N ($1 \leq N \leq 10^5$) (the size of the first palette), M ($1 \leq M \leq 10^5$) (the size of the second palette), and Q ($1 \leq Q \leq 10^5$) (the number of queries).

Each of the following two lines contains N colors ($0 \leq cn_i \leq 10^5$) representing the palette P_a and M colors ($0 \leq cm_i \leq 10^5$) P_b representing the palette P_b.

The following lines contain Q queries. Each query is represented as an integer c ($0 \leq c \leq 10^5$).

Output

For each query, print the number of pairs that can result in c.

Example

standard input	standard output
3 2 4 1 2 3 2 4 1 3 5 7	0 1 2 1

Note

A combination of two colors is their sum.

The first test case means that the palette P_a has the colors number 1, 2, and 3 while the palette P_b has the colors 2 and 4. So, a combination for the color 1 cannot be calculated from the sum of any element of P_a and P_b while for color 5, we can get it in two ways (1, 4) and (3, 2).

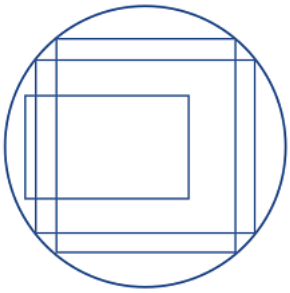
Problem C. Best Shape

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

You all know the story of the walls of the 3 cities in the famous 'Attack on Titans' and why it was designed circular and not in another form.

Now we will ask you to calculate the area of the biggest rectangle that can fit inside a city surrounded by a circular wall of Radius R.

An example:



Input

The input is composed of several test cases. The first line contains an integer T denoting the number of them ($1 \leq T \leq 100$).

Followed by T lines, each contains an integer R : ($1 \leq R \leq 50000$).

Output

For each case print one line containing the area of this rectangle rounded to the nearest integer.

Example

standard input	standard output
2 1 2	2 8

Problem D. Groups

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1.5 seconds
Memory limit:	256 megabytes

On an island, People decided to split into groups, so everyone currently is assigned to one group or not assigned yet. Each group name is a lowercase English letter (from 'a' to 'z'). there are N people. They are standing in a line.

We need to assign unassigned people to groups so that:

- No two people in the same group are standing next to each other.
- The total number of different groups is minimized.

Print minimum number of groups or -1 if impossible to satisfy the conditions.

Input

The first line will contain ($1 \leq T \leq 100$) the number of test cases. Each test case will have one string S which consists of lowercase English letters and dots only ('.') ($1 \leq |S| \leq 10^5$).

Output

For each test case, print a single line containing only one number, the number of groups or -1 if it's impossible to satisfy the requirements.

Example

standard input	standard output
3 a.ab..a a.c.c.b c.z.b...a	2 3 4

Problem E. WFH Seating

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

After the switch to WFH (work from home) for some Moroccan companies, they required their teams to book their seats beforehand on their local platform.

One of the main challenges of the teams is to book a place where all the members are seated in contiguous places.

You are given a matrix (n, m) where each (i, j) position represents a seat. Each position in the matrix can have two values, 0 if the place is free, and 1 otherwise.

Given the number of members of a team, your task is to say if the team can be seated in a contiguous way.

If the team can't find a suitable complete contiguous place, the members of the team can be seated in small groups of contiguous places the size of no less than 2 places.

Input

First-line contains two integers n and m, with n are the width and m is the height of the matrix.

Following by n lines, and each line contains m values representing the availability of the seat.

The next line, contains the number of members of a team t.

$2 \leq n, m \leq 1000$

$2 \leq t \leq 1000000$

Output

Print "Yes" if the teams can be seated in a contiguous way. And "No" otherwise.

Example

standard input	standard output
2 3 0 1 0 0 1 0 4	Yes

Note

Two places are considered contiguous, if they are adjacent.

Problem F. Laser Beam

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. The word "laser"is an acronym for "light amplification by stimulated emission of radiation". The first laser was built in 1960 by Theodore H. Maiman at Hughes Research Laboratories, based on theoretical work by Charles Hard Townes and Arthur Leonard Schawlow. – Wikipedia

In one of our experiments, we want to study the transmission of laser beams in different environments, and more precisely the reflection of laser beams against optical mirrors.

We denote the the tip of our laser with a point S.

We wish to find an angle α at which the laser beams hits the target point E. (Figure 1)

Unfortunately, our laser battery is very limited, and we can't afford experimenting with different angles.

We need you to help us find a way to predict the path of the laser beam.

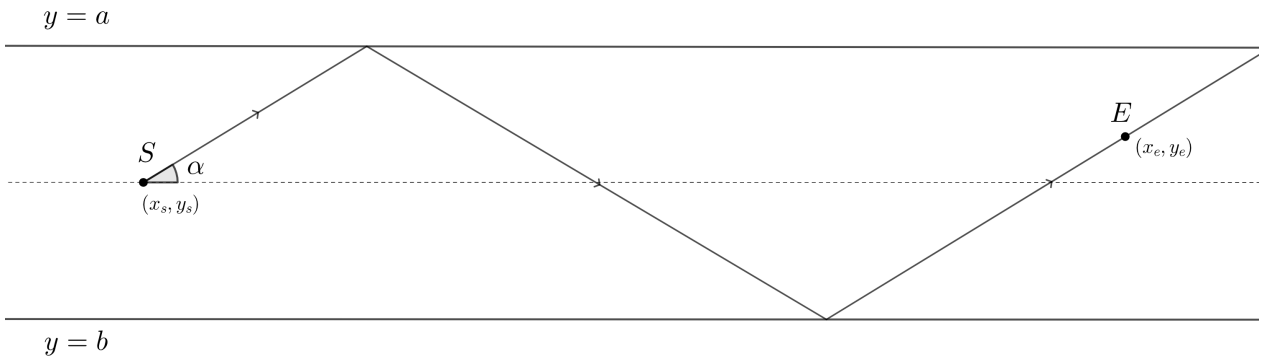


Figure 1: Projection of a laser beam from the point S with initial angle α

For the sake of simplicity, we will ignore any factors that would affect the laser's trajectory.

Input

The first line contains two integers a and b ($a \neq b$), the y-axis coordinates of the two optical mirrors accordingly.

The second line contains two integers x_s, y_s ($-10^9 \leq x_s, y_s \leq 10^9$) the coordinates of the point S.

The third line contains one integer, the initial angle α ($15 \leq |\alpha| \leq 75$, $\alpha \neq 0$).

The last line contains one integer x_e ($x_s \leq x_e \leq 10^9$) the x-coordinate of a point in the laser beam.

Output

Print the y-axis coordinate of the laser beam at the given x_e.

Examples

standard input	standard output
0 2 0 0 45 2	2.000000
-2 2 0 0 45 2	2.000000