Problem A. Avid butterfly collector

Input filename:	`collect.in`
Output filename:	`collect.out`
Time limit:	4 seconds
Memory limit:	256 Mb

It is well-known that Andrey Sergeevich is an avid butterfly collector. He has an enormous collection, with exhibits from all over the world. Let's assume that there are 2 000 000 000 species of butterflies in the world.

Andrey Sergeevich assigned a unique index to every species, starting from 1.

He now would like to find out whether a butterfly of a specie K is already in the collection, or he will need to add it, spending lots of time and money.

Input file format

The first line contains a single integer $1 \leq N \leq 100\,000$, the number of species in the collection of Andrey Sergeevich.

The second line contains N space-separated integers, sorted in increasing order, the species' indices in the collection.

The third line contains a single integer $1 \leq M \leq 100\,000$, the number of queries.

The last line contains M space-separated integers, the indices of species to query.

Output file format

Print M lines. Answer `"YES"` to the query if the butterfly with a given index is already in the collection, and `"NO"` otherwise.

Sample tests

collect.in	collect.out
7 10 47 50 63 89 90 99 4 84 33 10 82	NO NO YES NO

Problem B. Cows into Stalls

Input filename:	`cows.in`
Output filename:	`cows.out`
Time limit:	2 seconds
Memory limit:	256 Mb

There are several stalls on the real line. Your task is to place cows into these stalls, maximizing the minimal distance between cows.

Input file format

The first line contains number of stalls $3 \le N \le 10\,000$ and number of cows $2 \le K < N$. The second line contains N positive integers in the increasing order, denoting the stalls' coordinates, which are at most 10^9.

Output file format

Print the maximal possible distance between cows.

Sample tests

cows.in	cows.out
5 3 1 2 3 100 1000	99

Problem C. Firewood Meadow

Input filename:	`forest.in`
Output filename:	`forest.out`
Time limit:	2 seconds
Memory limit:	256 Mb

Little boy Fermat lives in a village. The winter is coming, and his grandma asked him to go to the forest to collect some firewood. There is a magical Firewood Meadow in the woods nearby the village. It has a never-ending firewood. Naturally, this is the Fermat's destination.

The only problem is that the path to the Meadow is not particularly short. Specifically, Fermat walks slower in the forest than in the fields surrounding the village.

- Village has coordinates $(0, 1)$.
- Meadow has coordinates $(1, 0)$.
- Fields-forest border is a horizontal line $y = a$, where $0 \le a \le 1$ is a given real number.
- Fermat's walking speed is V_p in the fields, and V_f in the forest. He may walk in either biome when walking along the border.

Find the optimal forest entrance point, which minimizes the total walking time.

Input file format

The first line contains two positive integers $1 \le V_p, V_f \le 10^5$. The second line consists of a single real number $0 \le a \le 1$, the y-coordinate of the fields-forest boundary.

Output file format

Print a single line containing the x-coordinate of the optimal forest entrance point, with the precision of at least 8 decimal digits.

Sample tests

forest.in	forest.out
5 3 0.4	0.783310604
5 5 0.5	0.500000000

Problem D. Root of a Cubic

Input filename:	`cubroot.in`
Output filename:	`cubroot.out`
Time limit:	1 seconds
Memory limit:	256 Mb

You are given a cubic equation $ax^3 + bx^2 + cx + d = 0$ ($a \neq 0$). It is guaranteed that it has exactly one root. Find it!

Input file format

On the first and only line, four space-separated integers are given: $-1000 \leq a, b, c, d \leq 1000$.

Output file format

On the first and only line print the root, with the precision of at least 6 decimal digits after the decimal point.

Sample tests

cubroot.in	cubroot.out
1 -3 3 -1	1
-1 -6 -12 -7	-1

Problem E. Trains

Input filename:	`trains.in`
Output filename:	`trains.out`
Time limit:	2 seconds
Memory limit:	256 Mb

Following the increased number of railroad accidents on the Kostroma–Sudislavl' railway, the railroad administration decided to change the train movement schedule. The meticulous analysis revealed, that the optimal schedule is the following: initially the train moves for T_1 minutes with the velocity of V_1 meters per minute, then T_2 minutes with velocity V_2, ..., and finally for T_N minutes with velocity V_N. During some intervals, the train may stay still (velocity will be 0).

However, according to the current safety regulations, the distance between two consecutive trains may not be shorter than L meters. Find the minimum possible time interval between the departure of two consecutive trains moving according to the optimal schedule and complying with safety regulations.

Input file format

The first two lines contain two positive integers: the minimum distance $100 \leq L \leq 10\,000$ and the number of schedule segments $1 \leq N \leq 1000$. The following N lines contain pairs $1 \leq T_i \leq 1000$, $0 \leq V_i \leq 1000$, describing the optimal schedule.

Output file format

On the first and only line print the requested minimum time interval, with the precision of at least 3 decimal digits after the decimal point.

Sample tests

trains.in	trains.out
1000 4 10 0 30 80 15 0 20 100	27.500