Candy distribution

Mouse Stofl has three sisters – Ada, Binna and Claudia. The sisters have collected a, b and c candy, respectively. As they often argue when there is inequality, their father will give them extra candy so that each of them will have the same amount.

The father has an unlimited supply of candy. He will distribute the candy in rounds. In each round he will take two candies, one in each paw. Each of these candies will be given to one of the sisters, and each to a different one. This way, two of the three sisters will get a single piece of candy in each round.

What is the minimum number of rounds needed to achieve equal distribution of candy?

Input

The only line of the input contains three space separated positive integers a, b and c.

Output

Output a single integer – the minimum number of rounds.

If the candy counts cannot be made equal using this process in a finite number of rounds, output -1 instead.

Limits

There are 2 test groups, each worth 50 points.

- In test group 1, we have $a, b, c \leq 10^4$.
- In test group 2, we have $a, b, c \leq 10^{18}$.

Examples

Input	Output
`1 2 3`	`3`

The father gives twice a candy to Ada and Binna and once adds candy to Ada and Claudia. After these three rounds all three mice will have 4 candy.

Input	Output
`2 2 2`	`0`

The mice have the same candy counts and hence the father does not need to give them more candy.

Workshops

You're asked to organize the workshops for the next SOI year. To make sure that every participant is able to go to a workshop, you want to organize as many workshops as possible, but this is not easy. Each workshop requires the presence of a number of organizers. There are N jobs for which some organizers are needed (job i requires the full dedication of a_i volunteers per workshop). But only a limited number of people are available, and each of them is only ready to do their favourite job – and only once, but the date does not matter to them. There are b_i organizers for job i.

There are therefore often shortages of volunteers for one specific job – for example, the kitchen team is quite unpopular. Luckily, the olympiad has some number of extra volunteers that are really nice and are ready to do any job they're asked to – let's call them jokers. There are J of them. They can only participate in one workshop and they can only manage to help with one job.

How many workshops can you organize if you assign jobs to the jokers optimally?

Input

The first line contains N and J, the number of jobs per workshop and the number of "jokers". The second line contains N integers: $a_0, \cdots, a_{N-1}$, the amount of people required per workshop for each task. The third line contains N integers: $b_0, \cdots, b_{N-1}$, the amount of available volunteers for each task.

Output

Print the maximum number of workshops that can be organized.

Limits

There are 3 test groups.

- In test group 1, worth 20 points, we have $1 \leq N \leq 5000$, $0 \leq J \leq 5000$ and $1 \leq a_i, b_i \leq 5000$.
- In test group 2, worth 30 points, we have $1 \leq N \leq 10^5$, $J = 0$ and $1 \leq a_i, b_i \leq 10^9$.
- In test group 3, worth 50 points, we have $1 \leq N \leq 10^5$, $0 \leq J \leq 10^9$ and $1 \leq a_i, b_i \leq 10^9$.

Examples

Input	Output
3 1 2 1 4 11 3 16	4

You already have enough people for jobs 0 and 2 to organize four workshops. You just need one extra person for job 1, since $4 \cdot 1 - 3 = 1$*, so you use your only joker on that.*

Input	Output
4 10 7 4 6 3 6 8 7 1	1

There are already more than enough volunteers for tasks 1 and 2 for one workshop. There are enough available jokers – by a large margin – to organize this workshop, since only three extra volunteers are needed, but 18 would be needed to organize a second one.

Tollroads

In Mouseland, there are N cities connected by M state and K private highway segments. Each highway segment can be used in both directions and one can reach every city from every other city via (multiple) state or private highway segments. The state highway segments can be used free of charge. The private highway segments can be used after paying a toll of **one Mouse Franc** per highway segment.

Mouse Stofl founded a consulting company for car drivers in Mouseland and has already received Q requests. Every request is of the form: how much does a cheapest drive from the city s to the city t cost. Could you help Mouse Stofl to handle all requests as quickly as possible?

Input

The first line of input consists of four integers: the number of cities N, the number of state highway segments M, the number of private highway segments K, and the number of requests Q. The following M lines of input consist of two integers each, a_i and b_i ($0 \leq a_i, b_i < N$, $a_i \neq b_i$), that describe a *state* highway segment between the cities a_i and b_i. The following K lines of input consist of two integers each, a_i and b_i ($0 \leq a_i, b_i < N$, $a_i \neq b_i$), that describe a *private* highway segment between the cities a_i and b_i. The last Q lines of input consist of two integers each, s_i and t_i ($0 \leq s_i, t_i < N$), that describe the two cities occurring in a request. There can be multiple state and private highway segments between the same pair of cities.

Output

For each of the Q requests, output the price of a cheapest drive between the respective cities.

Limits

There are four test sets, each worth 25 points.

- In test set 1, we have $1 \leq N \leq 500$, $0 \leq M \leq 10^4$, $0 \leq K \leq 500$, $1 \leq Q \leq 10^4$.
- In test set 2, we have $1 \leq N \leq 500$, $0 \leq M \leq 10^4$, $0 \leq K \leq 500$, $1 \leq Q \leq 10^6$.
- In test set 3, we have $1 \leq N \leq 10^4$, $0 \leq M \leq 10^5$, $0 \leq K \leq 10^3$, $1 \leq Q \leq 10^4$.
- In test set 4, we have $1 \leq N \leq 10^4$, $0 \leq M \leq 10^5$, $0 \leq K \leq 10^3$, $1 \leq Q \leq 10^6$.

Samples

Input	Output
4 5 2 3 0 1 0 2 1 2 3 2 0 3 0 1 1 2 0 1 0 2 1 2	0 0 0

Input	Output
6 3 3 4 0 1 1 2 3 4 0 2 1 3 4 5 0 2 0 4 3 4 0 5	0 1 0 2

Pizzacut

There were n Mice that participated in the SOI workshop and now they're very hungry. Mouse Binna hence plans to order some pizza. Each pizza weighs exactly $A \cdot B$ grams and mouse Binna may only order whole pizzas. The pizza can be ordered as A slices of B grams each or as B slices of A grams each. For each pizza, mouse Binna may separately decide in which way the pizza should be cut. The i-th mouse wants to eat at least g_i grams of pizza, but the mouse doesn't mind if it gets more pizza. Due to hygiene reasons, two mice may not share slices, so each mouse should get one or more whole slices and eat those. What's the minimum number of pizzas mouse Binna has to order?

Input

The first line of the input contains three integers n, A, B – the number of mice and two parameters describing the pizzas as above. The second line contains n integers g_i – the minimum number of grams of pizza the i-th mouse wants to eat.

Output

Print a single integer – the minimum number of pizzas mouse Binna has to order.

Limits

In all test cases $1 \leq n, 1 \leq g_i \leq 10^9$ and $1 \leq A, B$.

- Subtask 1 (15 Points): $n \leq 20, A, B \leq 30, g_i \leq 2 \cdot AB$.
- Subtask 2 (15 Points): $n \leq 80, A, B \leq 100, g_i \leq 2 \cdot AB$.
- Subtask 3 (15 Points): $n \leq 80, A, B \leq 100$.
- Subtask 4 (20 Points): $n \leq 300, A, B \leq 400, g_i \leq 2 \cdot AB$.
- Subtask 5 (5 Points): $n \leq 300, A, B \leq 400$.
- Subtask 6 (20 Points): $n \leq 2 \cdot 10^4, A, B \leq 400$.
- Subtask 7 (10 Points): $n \leq 3 \cdot 10^6, A, B \leq 300$.

Examples

Input	Output
`6 5 7` `5 7 2 4 5 1`	`1`

Binna can order a single pizza cut into 7 slices of 5 grams each. The second mouse will get two slices and every other mouse gets exactly one slice.

Input	Output
`5 6 4` `4 4 4 6 6`	`2`

While a single pizza would provide $24 = 4 + 4 + 4 + 6 + 6$ grams of pizza, it is not possible to slice it such a way that all mice can be fed. Hence mouse Binna has to order two pizzas.

Input	Output
5 6 5 12 15 15 10 6	2

Input	Output
2 8 10 800000000 320000000	14000000