Problem A. Granopodus

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

The planet Tau Ceti is home to a delicious fish species called granopodus. These fish have the shape of a convex polyhedron, the number of faces of which varies between 4 and 100.

A taucetizen called R2D2 has caught n granopoduses and wants to fry them. R2D2 can fit only m fish in their pan. It takes 1 minute to fry a single face of a granopodus. R2D2 has neatly separated their catch into heaps according to the number of faces of a fish.

What maximal number of fish can R2D2 manage to fry in k minutes?

Input

Input data is given in three lines. First line contains three numbers n, m, k ($n, m, k \leq 2500$). The second line contains the quantities of fish in each of the heap. Obviously, the sum of these numbers is n. The last line contains the number of faces for granopoduses in each of the heaps in the same order as on the second line.

Output

Output one integer — the number of fish.

Scoring

Each test is scored independently.

Example

standard input	standard output
2 3 4 2 4	2

Problem B. Sum of digits

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

An inquisitive novice programmer Petya has noticed that the the sum of an integer number's digits behaves peculiarly as the number increases. Sometimes it increases uniformly with the number, but sometimes it falls sharply. For example, starting from the number 96, the digit sum changes in following way: 15, 16, 17, 18, 1, 2, 3, and so on. Petya also also dabbles in math and knows that among consecutive N integers there will always be one that is divisible by N. But for the digit sums of consecutive integers, this is not true. Thus, for example, among the numbers between 92 and 108 none has the sum of digits divisible for 10.

Petya is considering a number K and wants to find out the maximum number of consecutive integers, for which the sum of digits is not divisible for K. Help Petya to find the answer to this question.

Input

A single natural number K ($1 < K \leq 40$).

Output

Output on the first line the maximum possible number of consecutive integers with sum of digits not divisible by K. Output the first number of such sequence on the second line.

Scoring

Each test is scored independently.

Example

standard input	standard output
10	18 1

Problem C. International Olympiad

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

Everybody loves olympiads in informatics. And everyone loves to participate in them. There is no unified international informatics olympiad on the planet Tau Ceti. But each country holds its own international olympiad for school students.

Taucetizens consider an olympiad to be international if, in addition to the hosting country, at least one student from another country participates in it. Every host country tries to minimize the costs and, accordingly, to minimize the number of foreign participants. However, in order not to lose the status of an international olympiad, it invites all members of the national team from only one country.

In total on Tau Ceti there are n active participants of the olympiads from m countries. The strength of a participant is determined by their rating on a reputable online programming contest site. No two participants have the same rating. Thus for any two participants we can determine who is stronger.

The hosts can not lose face, so they want the first place to be taken by a member of their team, and a member from the invited country to take the last place. Thus, the host country invites the team from another country if the strongest and weakest participants of the host country are stronger than the strongest and weakest participants of the invited team, respectively. If there are several options, the country with the smallest number of participants is chosen.

Pursuing various goals, the competitors may change their nationality, and thus can participate for a new country.

You need to handle q requests. Each request belongs to one of two types:

1. A country g wants to host an olympiad. You have to output the number of the country it will invite.
2. Participant number x changes their citizenship to country g.

Input

The first line contains three integers n, m, q ($1 \le m \le n \le 1000, 1 \le q \le 3 \cdot 10^5$) — the total number of participants on the planet, the number of countries and the number of requests, respectively.

The sacond line contains n country numbers describing the participants in the descending order of their ranking.

The following q lines describe the queries. Each query starts with an integer t ($1 \le t \le 2$) — the type of the query, followed by

- For the query of the first type, the number g — the number of the country wanting to host an olympiad;
- For the second query type, the numbers x and g — the number of the participant and their new country, respectively.

It is guaranteed that each country has at least one representative at any given time.

Output

For each query of the first type, print the number of the country that the hosts will invite. If there is more than one possible country, print any of them. If there is none — print -1.

Scoring

A group is solved correctly if each of the inputs it contains is solved correctly. Points are awarded only for correctly solved groups of inputs. Some subtasks may also require that all tests in the sample pass. For such subtasks, the letter S is indicated additionally.

Subtask	**Constraints**	**Points**	**Required subtasks**
1	$1 \le n,\ m,\ q \le 100,\ \ t = 1$	5	—
2	$1 \le q \le 1000,\ \ t = 1$	15	1
3	$1 \le q \le 1000$	20	S, 1, 2
4		60	S, 1, 2, 3

Examples

standard input	standard output
12 4 4 1 1 2 2 2 4 1 4 3 2 3 3 1 1 1 2 1 3 1 4	4 3 -1 3
12 4 6 1 1 2 2 2 4 1 4 3 2 3 3 2 12 1 2 9 4 1 1 1 2 1 3 1 4	-1 3 -1 3

Problem D. Mex tree

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	512 megabytes

Consider a tree of size n (a connected graph consisting of n vertices and $n-1$ edges). Initially all vertices are in off state. When a vertex is turned on, *mex* of all numbers in neighboring activated vertices is written to it. The *mex* of a list of numbers is defined as the minimum integer non-negative number not contained in the list. For example, *mex* of list $[3, 0, 0, 1]$ is 2, and for the list $[1, 2, 3]$ the mex is 0.

What is the maximal sum of numbers written in the vertices of the tree can be obtained after switching on all the vertices? It is known that the vertices are switched on one by one.

Input

The first line contains an integer n ($1 \le n \le 3 \cdot 10^5$) — the number of vertices in the tree.

The next $n-1$ lines contain pairs of integers u, v ($1 \le u, v \le n$) — the edges of the tree.

Output

Output a single integer, the maximal possible sum of numbers written in the vertices of the tree.

Scoring

For all subtasks, points are given only when all tests of that and required subtasks have passed correctly.

Subtask	Constraints	Points	Required subtasks
1	$n \le 8$	8	—
2	$n \le 13$	13	1
3	$n \le 500$	14	1 – 2
4	$n \le 5000$	15	1 – 3
5	$n \le 10^5$	40	1 – 4
6	$n \le 3 \cdot 10^5$	10	1 – 5

Examples

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