Problem A. Shower

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

After experiencing a power outage a few days ago, NTHU encounter a water shortage. In order to take a shower, Daniel has to go to NYCU to buy water.

There are a total of n barrels of water, each priced the same but with different volume. The volume of the i-th barrel is v_i liters. Daniel needs a total of K liters of water to take his shower. He would like you to tell him the minimum number of barrels he needs to buy.

Input

The first line has two integers n, K ($1 \leq n \leq 2 \cdot 10^5$, $1 \leq K \leq 10^9$). The second line has n integers: $v_1, v_2, \ldots, v_n$.

Output

Print an integer: the minimum number of barrels Daniel needs to buy to take his shower. If the total volume of all barrels is less than K, output -1.

Examples

Standard Input	Standard Output
6 30 4 1 14 9 5 12	3

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Problem B. Electricity Outage

Time limit:	please refer to DOM Judge
Memory limit:	please refer to DOM Judge

NTHU is a famous university in Taiwan. In NTHU, there would be an electricity outage once in a while. As a freshman at NTHU, LittlePants is not used to this, so he would like to know if there's electricity available at some moments.

There are two types of events in NTHU:

- 1 l r: Principal Kao declares that during the time slot $[l, r]$, there would be no electricity for the students.
- 2 x: LittlePants wants to know if there's electricity available at time x.

It is known that every time slot principal Kao mentioned would be disjoint. i.e. They do not intersect with each other.

For events of type 2, you have to answer LittlePants's question.

Hint: You may try using the built in function lower_bound or upper_bound in std::set

Input

The first line has an integer n, denotes the number of events.

From line 2 to line $1 + n$, each line would contain an event.

- $1 \leq n \leq 10^5$
- $1 \leq l \leq r \leq 10^9$
- $1 \leq x \leq 10^9$

Output

For events of type 2, output 0 if there's no electricity at the time, or 1 otherwise.

Examples

Standard Input	Standard Output
7 2 828294317 2 906225775 2 451248962 1 156496533 206131365 1 777023756 784244053 1 5202672 18762208 2 990121193	1 1 1 1
14 1 860446247 862758881 1 597956353 677673184 2 165670656 2 547410252 2 338126199 2 937561353 1 865781479 894754873 1 108448112 141092245 2 904146621 2 120585620 2 981402820 2 610199570 2 128247007 2 1780688	1 1 1 1 1 0 1 0 0 1

Problem C. Social Distance

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

Dear teachers and students,

Currently, a power outage has occurred due to cable damage, and we deeply apologize for the inconvenience caused. As a gesture of our apology, we have arranged rooms at a one-star hotel for everyone to evacuate in an orderly manner. To prevent the risks of overcrowding, we kindly ask everyone to maintain social distance. Thank you.

Sincerely,

Office of General affairs and Division of construction and maintenance of NTHU

In the high-tech era of 2023, NTHU has embedded electronic chips in the arms of every student to track their locations. As written in the letter, students will form a straight line during the evacuation. The positions of the line are represented by integer coordinates. As the president of the school, Mr. Gao, you aim to prevent a domino effect from students stumbling in the dark. An alarm will be triggered when two students are within a distance of less than k, ensuring their alertness and safety. However, during the evacuation process, some students might leave the queue due to impatience or attempt to cut in line in the darkness. Your task is to decide whether to trigger the alarm after each event.

Input

The first line has two integers n, k.

The second line has n integers, $a_1, \ldots, a_n$, where the students initially stand at.

The third line has one integer q, the number of events.

For the next q lines, each line contains two integers $type, p$.

- $type = 1$: One student from position p leaves the line.
- $type = 2$: One student cut in line at position p.

For each event of $type = 1$, there's at least one student standing at position p.

Note that since the students are slim in body shape, two students can stand in the same position.

- All inputs are integers.
- $1 \leq n, q \leq 10^5$
- $1 \leq p, k, a_i \leq 10^9$
- $type \in 1, 2$

Output

Print q lines. After each event, determine whether you should trigger the alarm. If so, print "QQ". If not, print "OuOb".

Examples

Standard Input	Standard Output
5 5 20 30 10 50 40 4 2 26 2 34 1 30 2 10	QQ QQ OuOb QQ

Standard Input	Standard Output
2 1 1 2 1 2 1000000000	OuOb

Problem D. Repairing Cables

Time limit:	please refer to DOM Judge
Memory limit:	please refer to DOM Judge

There are n broken cables in NTHU, principle Kao wants to fix them.

It is known that repairing cable i will take $\lceil \frac{c_i}{x} \rceil$ minutes if principle Kao puts x dollars into repairing this cable.

All these cables can be repaired simultaneously, meaning that the amount of time of the whole repairing process is equal to the maximum amount of time needed among each cable.

Principle Kao aims to have all cables fixed as quickly as possible. Now given his budget m, please calculate the minimum amount of time needed to fulfill his requirement.

Note: Principle Kao has to put at least 1 dollars into repairing each cable, and he can put different dollars on different cables.

Input

The first input line has two integers n and m, described in the statement.

For the $2 \sim n+1$ line, each contains an integer: c_1 to c_n respectively.

- $1 \leq n \leq 10^5$
- $n \leq m \leq 10^9$
- $1 \leq c_i \leq 10^9$

Output

Print one integer: the minimum amount of time(in minutes).

Examples

Standard Input	Standard Output
7 7 400661460 729265533 691368387 140066687 337315365 448837068 769191258	769191258
14 120 436609017 553234786 502670254 225476678 432677181 69541285 828136398 574694048 976905913 964970638 245153068 616832388 684738329 330693243	65127061

Problem E. Board Game

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

A new board game based on the daily life at National Tsing Hua University has recently been released, and it's gained immense popularity due to its realistic scenarios. This board game consists of n squares arranged in a circle, with each square labeled from 1 to n, and each square represents a hardship that Tsing Hua University students might encounter, such as "Power Outage", "Water Supply Disruption", "Toilet Explosion", and more.

This board game uses a special K-sided die, with each side showing numbers $d_1, d_2, ..., d_k$. The movement rules are also different from regular Monopoly. If you are originally on square a, and the die rolls the number b, you will move to square $a \times b$. If $a \times b$ is bigger than n , then it will continue from square 1 . More precisely, it will go to square $(a \times b - 1 \mod N) + 1$

But if the game is all disasters, just like in the students' life at Tsing Hua University, no one would want to play it. Among the n squares, there's one square numbered x, which is the game's only salvation. It's labeled "Escape from Tsing Hua University."

So, everyone's goal is to reach square x 4 3 1 1 1 as quickly as possible. Please help calculate the minimum number of times the die must be rolled, starting from square 1, to reach square x. If it's impossible to reach, please output "I LOVE TSING HUA".

Input

The first line has three integer n, x, k.

The second line has k integers $d_1, ...d_k$: the number written on the K-sided die.

- $(1 < x \leq n \leq 2 \cdot 10^6)$
- $(1 \leq d_i \leq 2 \cdot 10^6)$
- $(1 \leq k \leq 50)$

Output

Print the minimum number of times the die must be rolled to get to square x if possible, else print "I LOVE TSING HUA".

Examples

Standard Input	Standard Output
1000000 48763 3 11 13 31	4
1000000 999999 1 2	I LOVE TSING HUA

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Problem F. Bon Bon Bombs

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

Lately, Klee has targeted National Tsing Hua University. She wants to place bombs on the campus to destroy the power generators and cripple the school. After installing the bombs, Klee found this to be rather boring. So, she sent a warning letter to all the students at Tsing Hua University, providing clues to find the bomb placements.

In the warning letter, Tsing Hua University is represented as an $n \times m$ matrix, where each number at each position represents the number of bombs hidden within the 3×3 grid centered around that point (including the point itself). We know that Klee is quite clever, so at most one bomb can be placed at each position in the matrix.

Now that you've also received the warning letter, please help the panicked university president Gao to find out how many ways there are to place the bombs that meet the conditions before the bombs explode.

Input

The first line has two integer n, m ($1 \leq n, m \leq 20$). The second line to the $n+1$ line represent the $n \times m$ matrix.

Output

Print one integer, the number of legal ways to place the bombs.

Examples

Standard Input	Standard Output
5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	12
3 3 0 2 0 1 2 1 1 2 1	0

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