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Intercastellar

In 30XX, due to the constant efforts of scientists and engineers, interaction among different planets becomes very active. Bitaro is a beaver who is working as an ambassador of an exchange program. His task is to introduce foods from the Earth to the habitants in different planets. He will leave for the JOI Planet at 1:00 in the afternoon.

Now, Bitaro is planning to introduce castella to the habitants in the JOI Planet. The castella was already cut into several pieces. Castella is a baked sponge cake made of flour, egg, sugar, and starch syrup.

The shape of the castella is a horizontally long rectangular box. It was cut into N pieces. The length of the i -th piece ($1 \leq i \leq N$) from the left is an integer A_i .

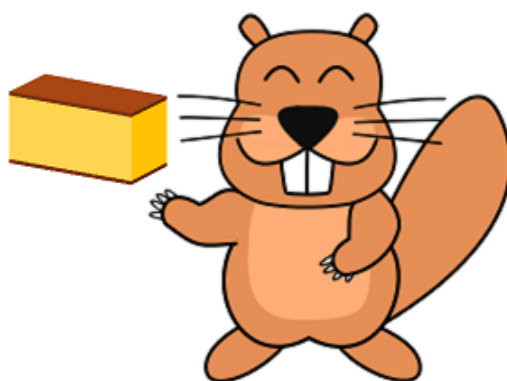
A couple of minutes ago, it turned out that the habitants in the JOI Planet do not like even integers. To cope with this problem, you will perform the following sequential operations until pieces of even length disappear.

1. Among the pieces of even length, you choose the rightmost one.
2. You cut the chosen piece into two pieces of equal length. Namely, if the length of the chosen piece is k , you cut it into two pieces of length $\frac{k}{2}$. You do not move the position of the pieces.

To confirm whether the operations are performed correctly, Bitaro will ask you Q questions. The j -th question ($1 \leq j \leq Q$) is as follows.

- After all the operations are performed, what is the length of the X_j -th piece from the left?

Given information of the castella and the questions, write a program which answer the questions.





Input

Read the following data from the standard input. Given values are all integers.

N

A_1

A_2

\vdots

A_N

Q

X_1

X_2

\vdots

X_Q

Output

Write Q lines to the standard output. The j -th line ($1 \leq j \leq Q$) should contain the answer to the j -th question.

Constraints

- $1 \leq N \leq 200\,000$.
- $1 \leq A_i \leq 1\,000\,000\,000$ ($1 \leq i \leq N$).
- $1 \leq Q \leq 200\,000$.
- $1 \leq X_j \leq 1\,000\,000\,000\,000\,000$ ($= 10^{15}$) ($1 \leq j \leq Q$).
- $X_j \leq X_{j+1}$ ($1 \leq j \leq Q - 1$).
- After all the operations are performed, the castella is cut into at least X_Q pieces.

Subtasks

1. (25 points) $A_i \leq 8$ ($1 \leq i \leq N$).
2. (35 points) $N \leq 1\,000$, $Q \leq 1\,000$.
3. (40 points) No additional constraints.



Sample Input and Output

Sample Input 1	Sample Output 1
4	7
14	9
9	1
8	1
12	1
6	3
2	
3	
5	
7	
11	
13	

In the beginning, the lengths of the pieces of the castella are 14, 9, 8, 12 from the left.

After all the operations are performed, the castella is cut into 15 pieces. The lengths of the pieces are 7, 7, 9, 1, 1, 1, 1, 1, 1, 1, 1, 3, 3, 3, 3 from the left.

This sample input satisfies the constraints of Subtasks 2, 3.



Sample Input 2	Sample Output 2
13	1
1	1
4	1
1	1
4	5
2	3
1	1
3	3
5	
6	
2	
3	
7	
3	
8	
2	
10	
11	
13	
15	
17	
18	
20	

This sample input satisfies the constraints of all the subtasks.



Sample Input 3	Sample Output 3
16	5
536870912	1
402653184	7
536870912	57
536870912	1
134217728	
536870912	
671088640	
536870912	
536870912	
536870912	
939524096	
805306368	
536870912	
956301312	
536870912	
536870912	
5	
2500000000	
3355443201	
4294967296	
5111111111	
6190792704	

This sample input satisfies the constraints of Subtasks 2, 3.