Problem F. Hilbert's Hotel

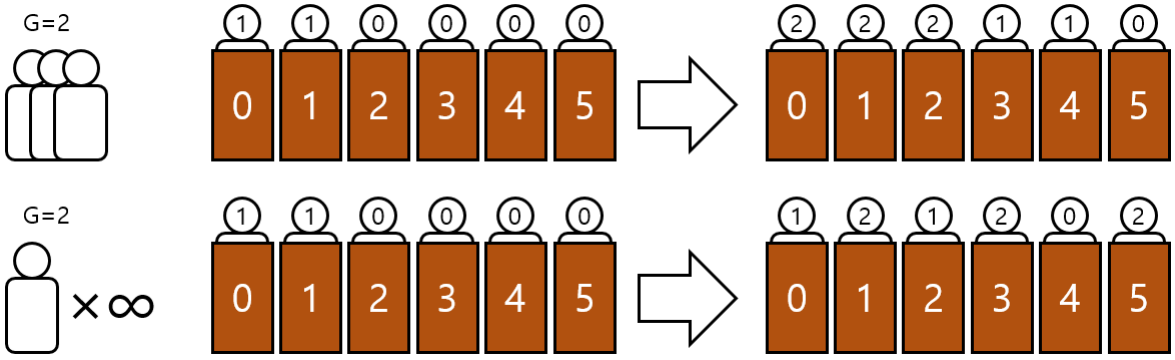
Input file:	*standard input*
Output file:	*standard output*
Time limit:	1.5 seconds
Memory limit:	1024 mebibytes

Hilbert's hotel has infinitely many rooms, numbered 0, 1, 2, ... At most one guest occupies each room. Since people tend to check-in in groups, the hotel has a group counter variable G.

Hilbert's hotel had a grand opening today. Soon after, infinitely many people arrived at once, filling every room in the hotel. All guests got the group number 0, and G is set to 1.

Ironically, the hotel can accept more guests even though every room is filled:

- If k ($k \geq 1$) people arrive at the hotel, then for each room number x, the guest in room x moves to room $x + k$. After that, the new guests fill all the rooms from 0 to $k - 1$.
- If infinitely many people arrive at the hotel, then for each room number x, the guest in room x moves to room $2x$. After that, the new guests fill all the rooms with odd numbers.



You have to write a program to process the following queries:

- `1 k` - If $k \geq 1$, then k people arrive at the hotel. If $k = 0$, then infinitely many people arrive at the hotel. Assign the group number G to the new guests, and then increment G by 1.
- `2 g x` - Find the x-th smallest room number that contains a guest with the group number g. Output it modulo $10^9 + 7$, followed by a newline.
- `3 x` - Output the group number of the guest in room x, followed by a newline.

Input

In the first line, an integer Q ($1 \leq Q \leq 300,000$) denoting the number of queries is given. Each of the next lines contains a query. All numbers in the queries are integers.

- For the `1 k` queries, $0 \leq k \leq 10^9$.
- For the `2 g x` queries, $g < G$, $1 \leq x \leq 10^9$, and at least x guests have the group number g.
- For the `3 x` queries, $0 \leq x \leq 10^9$.

Output

Process all queries and output as required. It is guaranteed that the output is not empty.

Example

standard input	standard output
10 3 0 1 3 2 1 2 1 0 3 10 2 2 5 1 5 1 0 3 5 2 3 3	0 1 0 9 4 4

Note

If you know about "cardinals," please assume that "infinite" refers only to "countably infinite." If you don't know about it, then you don't have to worry.