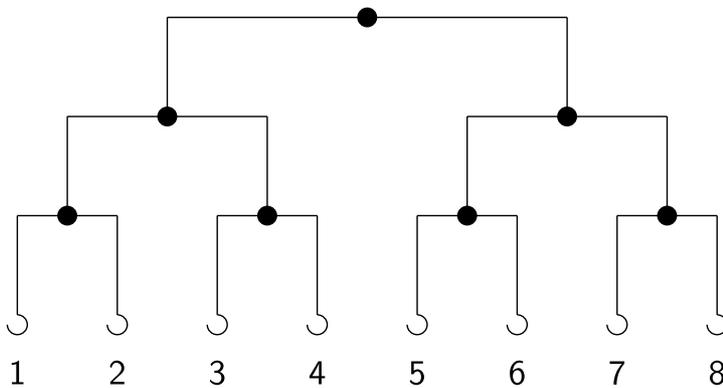


Hanging Rack

A hanging rack is composed of n levels of connected rods. Level i (for $i \in \{0, 1, \dots, n - 1\}$) consists of 2^i rods. The midpoint of the rod at level 0 is fixed to the wall. At all other levels, the midpoint of the j -th rod (for $j \in 1, \dots, 2^i$) is fixed to the left endpoint of the $\lceil j/2 \rceil$ -th rod at the previous level if j is odd and to the right endpoint of the same rod if j is even. At the last level, there is a hook for hanging a coat on both endpoints of each rod. The hooks are numbered from 1 to 2^n in the left-to-right order.

For example, the rack for $n = 3$ looks as follows:



Mojca would like to hang all her coats on the rack. Every coat weighs exactly 1 unit. To avoid breaking the delicate structure, she has to hang them in such an order that the difference between the total weight w_l placed on the left endpoint of any given rod and the total weight w_r placed on the right endpoint of the same rod is either 0 or 1 ($w_l - w_r \in \{0, 1\}$). (By the laws of physics, the difference could also be -1 , but a right-leaning rack looks really ugly to Mojca.) The rods are so thin that their weight can be neglected.

Having heard about your problem-solving proficiency, Mojca asks you for help. Write a program that reads the integer n and an integer k and prints the sequential number (modulo $(10^9 + 7)$) of the hook on which Mojca has to hang her k -th coat.

Input

The input consists of a single line, which contains the integers n and k , separated by a space.

Output

Print the number (modulo $(10^9 + 7)$) of the hook to be used in the k -th step.

Constraints

- $n \in [1, 10^6]$.
- $k \in [1, \min\{2^n, 10^{18}\}]$.

Subtasks

- **20 points:** $n \in [1, 10]$.
- **20 points:** $n \in [1, 20]$.
- **60 points:** no additional constraints.

Example 1

Input

```
3 2
```

Output

```
5
```

Comment

In this case, the hooks should be used in the following order: 1, 5, 3, 7, 2, 6, 4, 8. In the second step, Mojca thus has to hang her coat on the hook with number 5.

Example 2

Input

```
5 10
```

Output

```
19
```

Comment

Here, the order of hooks is 1, 17, 9, 25, 5, 21, 13, 29, 3, 19, etc.

