1545. Find Kth Bit in Nth Binary String

Description

Given two positive integers `n` and `k`, the binary string S_n is formed as follows:

- S_1 = "0"
- $S_i = S_{i-1} + "1" + reverse(invert(S_{i-1}))$ for $i > 1$

Where `+` denotes the concatenation operation, `reverse(x)` returns the reversed string `x`, and `invert(x)` inverts all the bits in `x` (`0` changes to `1` and `1` changes to `0`).

For example, the first four strings in the above sequence are:

- S_1 = "0"
- S_2 = "0**1**1"
- S_3 = "011**1**001"
- S_4 = "0111001**1**0110001"

Return *the* k^{th} *bit in* S_n. It is guaranteed that `k` is valid for the given `n`.

Example 1:

```
Input: n = 3, k = 1
Output: "0"
Explanation: S3 is "0111001".
The 1st bit is "0".
```

Example 2:

```
Input: n = 4, k = 11
Output: "1"
Explanation: S4 is "0111001101 1 0001".
The 11th bit is "1".
```

Constraints:

- $1 <= n <= 20$
- $1 <= k <= 2^n - 1$