1680. Concatenation of Consecutive Binary Numbers

Medium 575 278 Add to List Share

Given an integer `n`, return *the **decimal value** of the binary string formed by concatenating the binary representations of* `1` *to* `n` *in order, **modulo*** $10^9 + 7$.

Example 1:

```
Input: n = 1
Output: 1
Explanation: "1" in binary corresponds to the decimal value 1.
```

Example 2:

```
Input: n = 3
Output: 27
Explanation: In binary, 1, 2, and 3 corresponds to "1", "10", and "11".
After concatenating them, we have "11011", which corresponds to the decimal value 27.
```

Example 3:

```
Input: n = 12
Output: 505379714
Explanation: The concatenation results in "110111001011101111000100110101010111100".
The decimal value of that is 118505380540.
After modulo 10^9 + 7, the result is 505379714.
```

Constraints:

- $1 <= n <= 10^5$

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```java
class Solution {
    public int concatenatedBinary( int n ) {

        long finalNumber = 0;

        for (int i = 1; i <= n; i++) {
            int numberOfDigits = 1 + log2(i);
            long intermediateNumber = (finalNumber << numberOfDigits) % 1000000007;
            finalNumber = (intermediateNumber + i) % 1000000007;
        }

        return (int) finalNumber;

    }

    private int log2( int i ) {
        return (int) (Math.log10(i) / Math.log10(2));
    }
}
```

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