660. Remove 9 <sup>C</sup>

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Start from integer 1, remove any integer that contains 9 such as 9, 19, 29...

So now, you will have a new integer sequence: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, ...

Given a positive integer n, you need to return the n-th integer after removing. Note that 1 will be the first integer.

## Example 1:

```
Input: 9
Output: 10
```

Hint: n will not exceed 9 x 10^8.

## Approach #1: Mathematical

## Intuition

Let's write the first numbers and try to notice a pattern. Those numbers are:

```
1, 2, 3, 4, 5, 6, 7, 8,
10, 11, 12, 13, 14, 15, 16, 17, 18,
20, 21, 22, 23, 24, 25, 26, 27, 28,
80, 81, 82, 83, 84, 85, 86, 87, 88,
100, 101, 102, ...
```

These numbers look exactly like all base-9 numbers!

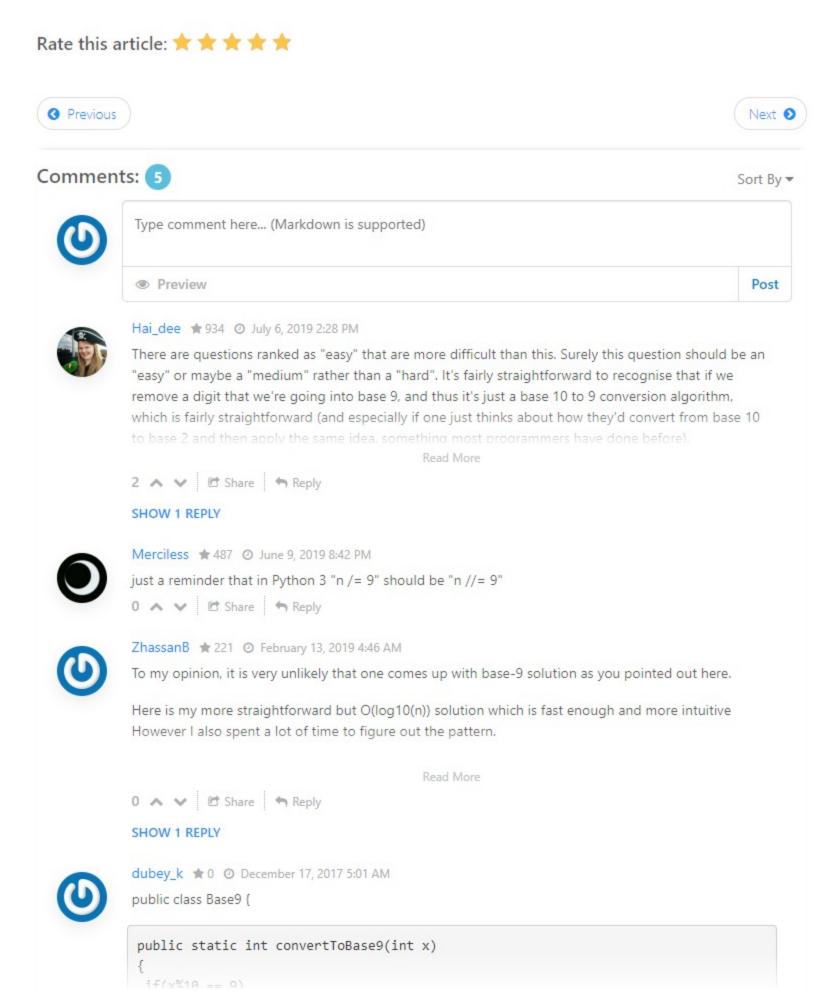
Indeed, every base-9 number is a number in this sequence, and every number in this sequence is a base-9 number. Both this sequence and the sequence of all base-9 numbers are in increasing order. The answer is therefore just the n-th base-9 number.

```
Сору
     Python
Java
1 class Solution(object):
       def newInteger(self, n):
3
          ans = ''
           while n:
5
              ans = str(n%9) + ans
              n /= 9
           return int(ans)
```

## **Complexity Analysis**

- Time Complexity: O(1), since N has at most 9 digits.
- Space Complexity: O(1).

Analysis written by: @awice.



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Approach #2 (log(n))

We can use binary search

HUMBLE.

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