7. Reverse Integer

Solution

Approach 1: Pop and Push Digits & Check before Overflow

Intuition

We can build up the reverse integer one digit at a time. While doing so, we can check beforehand whether or not appending another digit would cause overflow.

Algorithm

Reversing an integer can be done similarly to reversing a string.

We want to repeatedly "pop" the last digit off of x and "push" it to the back of the rev. In the end, rev will be the reverse of the x.

To "pop" and "push" digits without the help of some auxiliary stack/array, we can use math.

```
//pop operation:
pop = x % 10;
x /= 10;

//push operation:
temp = rev * 10 + pop;
rev = temp;
```

However, this approach is dangerous, because the statement $\text{temp} = \text{rev} \cdot 10 + \text{pop}$ can cause overflow.

Luckily, it is easy to check beforehand whether or this statement would cause an overflow.

To explain, lets assume that rev is positive.

1. If $temp = \text{rev} \cdot 10 + \text{pop}$ causes overflow, then it must be that $\text{rev} \geq \frac{INTMAX}{10}$
2. If $\text{rev} > \frac{INTMAX}{10}$, then $temp = \text{rev} \cdot 10 + \text{pop}$ is guaranteed to overflow.
3. If $\text{rev} == \frac{INTMAX}{10}$, then $temp = \text{rev} \cdot 10 + \text{pop}$ will overflow if and only if $\text{pop} > 7$

Similar logic can be applied when rev is negative.

C++ Java Copy

Complexity Analysis

- Time Complexity: $O(\log(x))$. There are roughly $\log_{10}(x)$ digits in x.
- Space Complexity: $O(1)$.

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(/kunlk2016)

kunlk2016 (/kunlk2016) ★ 0 17 hours ago

Can anyone help to explain why the time complexity is O(log(x)) other than O(n) ? For example, if the input number is 12345, then the while loop has to execute 4 times.

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(/shiye)

shiye (/shiye) ★ 0 2 days ago

class Solution(object):
def reverse(self, x):

```
    ret = 0
flag = True
```

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(/truth_seeker)

truth_seeker (/truth_seeker) ★ 5 3 days ago

How is point 3 above valid?
Can someone please explain this. if 'rel == INTMAX/10', then temp will overflow when pop > 0, right? Since temp will be (INTMAX + pop).
How did 7 come into picture?

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(/richardhui)

RichardHui (/richardhui) ★ 0 November 8, 2018 6:17 AM

//Java 100%beats 18ms

class Solution {
public int reverse(int x) {
String num=String.valueOf(x);

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