Documentation for Convert Integer to Base 7

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1. Problem Statement

Given an integer num, return a string representing its base 7 representation.

Constraints:

- $-10^7 \leq \text{num} \leq 10^7$

2. Intuition

The problem is a straightforward conversion of a number from base 10 to base 7. We use repeated division by 7 and collect the remainders to build the base 7 number.

3. Key Observations

- Base 7 digits range from 0 to 6.
- The base 7 representation of a number is obtained by reversing the order of remainders from dividing the number repeatedly by 7.
- If the number is negative, the result should have a '-' sign.
- If the number is 0, return "0" directly.

4. Approach

- Handle 0: Return "0" if input is 0.
- Check for negative: Store the sign and work with the absolute value.
- Convert to base 7:
  - Use a while loop to divide the number by 7.
  - Collect remainders and prepend them to the result string.
- Attach '-' sign if the original number was negative.

5. Edge Cases

- num = 0: Should return "0"
- num = 1: Should return "1"
- num = -1: Should return "-1"
- num = 7: Should return "10"
- num = -7: Should return "-10"

6. Complexity Analysis

Time Complexity:

- $O(\log_7 n)$ — Each division by 7 reduces the number, so the number of steps is proportional to the number of base-7 digits.

Space Complexity:

- O($\log_7 n$) — For storing the result string of base-7 digits.

7. Alternative Approaches

- Using recursion instead of iteration for base conversion.
- Using built-in conversion functions (not recommended here since the challenge is to implement the logic manually).

8. Test Cases

Input	Output	Explanation
100	"202"	100 → 14 r2 → 2 r0 → 0 r2
-7	"-10"	Negative of 7 → "10"
0	"0"	Special case
343	"1000"	343 is 7^3
-49	"-100"	49 is 7^2

9. Final Thoughts

- This is a good problem for understanding base conversions and dealing with negative numbers.
- It reinforces the importance of handling edge cases like 0 and sign management.
- The iterative division approach is efficient and readable for this kind of number conversion.