Documentation for Excel Sheet Column Number Conversion

Problem Statement

Given a string columnTitle that represents the column title as it appears in an Excel sheet, return its corresponding column number.

In Excel, columns are labeled alphabetically:

- 'A' -> 1
- 'B' -> 2
- ...
- 'Z' -> 26
- 'AA' -> 27
- 'AB' -> 28
- ...

The sequence continues indefinitely in a manner similar to base-26 numeral systems.

1. **Example 1:**
   - **Input:** columnTitle = "A"
   - **Output:** 1
   - **Explanation:** 'A' corresponds to the 1st column.

2. **Example 2:**
   - **Input:** columnTitle = "AB"
   - **Output:** 28
   - **Explanation:** 'AB' corresponds to 26 (A is 1, multiplied by 26) + 2 (B is the 2nd letter).

3. Example 3:

- **Input:** columnTitle = "ZY"
- **Output:** 701
- **Explanation:** 'ZY' corresponds to (26 * 26) + 25 (Z is the 26th letter and Y is the 25th).

Constraints

- 1 <= columnTitle.length <= 7
- columnTitle consists only of uppercase English letters ('A' to 'Z').
- The input columnTitle is in the range ["A", "FXSHRXW"].

Approach to Solution

To convert the Excel column title to a column number, we follow these steps:

1. **Initialize a Result Variable:**
   - Start with a variable result set to 0. This will accumulate the final column number as we process each character in the input string.

2. **Iterate Over Each Character in the Column Title:**
   - Loop through each character in the string columnTitle.

3. **Calculate the Value of Each Character:**
   - For each character, compute its numeric value based on its position in the English alphabet. The value of a character 'A' is 1, 'B' is 2, ..., 'Z' is 26.
   - The formula to compute the position is ord(char) ord('A') + 1, where ord() is a function that returns the ASCII value of a character.

4. **Accumulate the Result Using a Base-26 System:**
    - Multiply the current result by 26 (since each step is like moving one digit to the left in a base-26 number system).
    - Add the computed value of the current character to result.

5. **Repeat for All Characters:**
    - Continue the process for each character in the string until the entire column title is processed.

6. **Return the Final Result:**
    - Once all characters have been processed, result will contain the final column number corresponding to the Excel sheet column title.

Mathematical Explanation

The problem can be understood as converting a number from a base-26 numeral system to a decimal system:

In a base-26 system:

- The first digit (rightmost) represents the 26^0 place.
- The second digit represents the 26^1 place.
- The third digit represents the 26^2 place, and so on.

For a column title like "AB":

- 'A' is in the 26^1 place: (1 times 26)
- 'B' is in the 26^0 place: (2 times 1)
- Therefore, the column number for "AB" is (1 times 26 + 2 = 28).

Time and Space Complexity

- **Time Complexity:** O(N), where N is the length of the string columnTitle. The algorithm processes each character exactly once, making it linear in time.

- **Space Complexity:** O(1), as it uses a fixed amount of additional space regardless of the input size.

Conclusion

- The solution efficiently converts an Excel-style column title into its corresponding column number using a straightforward loop and a base-26 conversion technique. This approach ensures optimal performance given the constraints.