

PROBLEM**Rohan's Love for Matrix**

Hard Accuracy: 45.55% Submissions: 16K+ Points: 8

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Rohan has a special love for the matrices especially for the first element of the matrix. Being good at Mathematics, he also loves to solve the different problem on the matrices. So one day he started to **multiply** the matrix with the **original matrix**. The elements of the **original matrix** **a** are given by [**a₀₀**=1, **a₀₁**=1, **a₁₀**=1, **a₁₁**=0]. Given the power of the matrix, **n** calculate the **aⁿ** and return the **a₁₀** element **mod 1000000007**.

Example 1:**Input:**

n = 3

Output:

2

Explanation: Take the cube of the original matrix
i.e **a³** and the (**a₁₀**)th element is 2.

Example 2:**Input:**

n = 4

Output:

3

Explanation: Take the cube of the original matrix
i.e **a⁴** and the (**a₁₀**)th element is 3.

Your Task:

You don't need to read input or print anything. Complete the function **firstElement()** which takes **n** as input parameter and returns the **a₁₀** element **mod 1000000007** of **aⁿ**.

Expected Time Complexity: O(n)

Expected Auxiliary Space: O(1)

Constraints:1 ≤ n ≤ 10⁶

CODE

```
class Solution:
    def firstElement(self, n):
        if n == 1 or n == 2:
            return 1

        a = [[1, 1], [1, 0]]

        def multiply(mat1, mat2):
            result = [[0, 0], [0, 0]]

            for i in range(2):
                for j in range(2):
                    for k in range(2):
                        result[i][j] += (mat1[i][k] * mat2[k][j]) % 1000000007

            return result

        def power(matrix, exponent):
            if exponent == 1:
                return matrix

            if exponent % 2 == 0:
                half_pow = power(matrix, exponent // 2)
                return multiply(half_pow, half_pow)

            else:
                return multiply(matrix, power(matrix, exponent - 1))

        result_matrix = power(a, n)
        return result_matrix[1][0] % 1000000007
```