Problem 2338: Count the Number of Ideal Arrays

Problem Information

Difficulty: Hard
Acceptance Rate: 57.02%
Paid Only: No
Tags: Math, Dynamic Programming, Combinatorics, Number Theory

Problem Description

You are given two integers `n` and `maxValue`, which are used to describe an **ideal** array.

A **0-indexed** integer array `arr` of length `n` is considered **ideal** if the following conditions hold:

* Every `arr[i]` is a value from `1` to `maxValue`, for `0 <= i < n`. * Every `arr[i]` is divisible by `arr[i - 1]`, for `0 < i < n`.

Return _the number of**distinct** ideal arrays of length _`n`. Since the answer may be very large, return it modulo `109 + 7`.

Example 1:

Input: n = 2, maxValue = 5 **Output:** 10 **Explanation:** The following are the possible ideal arrays: - Arrays starting with the value 1 (5 arrays): [1,1], [1,2], [1,3], [1,4], [1,5] - Arrays starting with the value 2 (2 arrays): [2,2], [2,4] - Arrays starting with the value 3 (1 array): [3,3] - Arrays starting with the value 4 (1 array): [4,4] - Arrays starting with the value 5 (1 array): [5,5] There are a total of 5 + 2 + 1 + 1 + 1 = 10 distinct ideal arrays.

Example 2:

Input: n = 5, maxValue = 3 **Output:** 11 **Explanation:** The following are the possible ideal arrays: - Arrays starting with the value 1 (9 arrays): - With no other distinct values (1 array): [1,1,1,1,1] - With 2nd distinct value 2 (4 arrays): [1,1,1,1,2], [1,1,1,2,2], [1,1,2,2,2], [1,2,2,2,2] - With 2nd distinct value 3 (4 arrays): [1,1,1,1,3], [1,1,1,3,3], [1,1,3,3,3], [1,3,3,3,3] -

Arrays starting with the value 2 (1 array): [2,2,2,2,2] - Arrays starting with the value 3 (1 array): [3,3,3,3,3] There are a total of 9 + 1 + 1 = 11 distinct ideal arrays.

Constraints:

* `2 <= n <= 104` * `1 <= maxValue <= 104`

Code Snippets

C++:

```
class Solution {
public:
int idealArrays(int n, int maxValue) {

}
};
```

Java:

```
class Solution {
public int idealArrays(int n, int maxValue) {

}
}
```

Python3:

```
class Solution:
def idealArrays(self, n: int, maxValue: int) -> int:
```