

Homework Questions:

1. Magical Prefix Sum

Story: In the magical land of Arrayville, each village keeps track of its treasure by maintaining an array of magical values. The villagers are curious about how many ways they can pick a prefix of their treasure array that has a product divisible by a certain number k .

Problem: Given an array of integers arr and a number k , find the number of prefixes of arr whose product is divisible by k .

Example:

- For $arr = [2, 3, 4, 6]$ and $k = 12$:
 - The prefixes $[2, 3, 4]$ and $[2, 3, 4, 6]$ have products divisible by 12 . So, the result is 2 .

2. Suffix Magic

Story: Sarah is designing a new puzzle game where players need to calculate the product of suffixes to find hidden treasures. In this game, players are given an array and need to determine the number of suffixes whose product is greater than a specified value x .

Problem: Given an array of integers arr and a number x , count the number of suffixes of arr whose product is greater than x .

Example:

- For $arr = [1, 2, 3, 4]$ and $x = 10$:
 - The suffixes $[2, 3, 4]$ and $[3, 4]$ have products greater than 10 . So, the result is 2 .

Story: A company is analyzing sales data where they need to find the maximum product of any prefix of the sales array to gauge their best performance streak.

Problem: Given an array of positive integers `arr`, calculate the maximum product that can be obtained from any prefix of the array.

Example:

- For `arr = [3, 2, 5, 6]`:
 - Prefix products are `[3, 6, 30, 180]`
 - The maximum product is `180`.

4. Prefix Product Modulo

Story: In a competitive coding challenge, participants are asked to calculate the prefix product modulo a large prime number for a given array.

3. Maximum Product of Prefixes

Product modulo a large prime number for a given array.

Problem: Given an array of integers `arr` and a prime number `p`, compute the prefix product array modulo `p`.

Example:

- For `arr = [2, 3, 5, 7]` and `p = 11`:
 - Prefix product array modulo 11 would be `[2 % 11, (2 * 3) % 11, (2 * 3 * 5) % 11, (2 * 3 * 5 * 7) % 11] = [2, 6, 4, 10]`.