Problem 3549: Multiply Two Polynomials

Problem Information

Difficulty: Hard
Acceptance Rate: 62.16%
Paid Only: Yes
Tags: Array, Math

Problem Description

You are given two integer arrays `poly1` and `poly2`, where the element at index `i` in each array represents the coefficient of `xi` in a polynomial.

Let `A(x)` and `B(x)` be the polynomials represented by `poly1` and `poly2`, respectively.

Return an integer array `result` of length `(poly1.length + poly2.length - 1)` representing the coefficients of the product polynomial `R(x) = A(x) * B(x)`, where `result[i]` denotes the coefficient of `xi` in `R(x)`.

Example 1:

Input: poly1 = [3,2,5], poly2 = [1,4]

Output: [3,14,13,20]

Explanation:

* `A(x) = 3 + 2x + 5x2` and `B(x) = 1 + 4x` * `R(x) = (3 + 2x + 5x2) * (1 + 4x)` * `R(x) = 3 * 1 + (3 * 4 + 2 * 1)x + (2 * 4 + 5 * 1)x2 + (5 * 4)x3` * `R(x) = 3 + 14x + 13x2 + 20x3` * Thus, result = `[3, 14, 13, 20]`.

Example 2:

Input: poly1 = [1,0,-2], poly2 = [-1]

Output: [-1,0,2]

Explanation:

* `A(x) = 1 + 0x - 2x2` and `B(x) = -1` * `R(x) = (1 + 0x - 2x2) * (-1)` * `R(x) = -1 + 0x + 2x2` * Thus, result = `[-1, 0, 2]`.

Example 3:

Input: poly1 = [1,5,-3], poly2 = [-4,2,0]

Output: [-4,-18,22,-6,0]

Explanation:

* `A(x) = 1 + 5x - 3x2` and `B(x) = -4 + 2x + 0x2` * `R(x) = (1 + 5x - 3x2) * (-4 + 2x + 0x2)` * `R(x) = 1 * -4 + (1 * 2 + 5 * -4)x + (5 * 2 + -3 * -4)x2 + (-3 * 2)x3 + 0x4` * `R(x) = -4 -18x + 22x2 -6x3 + 0x4` * Thus, result = `[-4, -18, 22, -6, 0]`.

Constraints:

* `1 <= poly1.length, poly2.length <= 5 * 104` * `-103 <= poly1[i], poly2[i] <= 103` * `poly1` and `poly2` contain at least one non-zero coefficient.

Code Snippets

C++:

```
class Solution {
public:
vector<long long> multiply(vector<int>& poly1, vector<int>& poly2) {

}
};
```

Java:

```
class Solution {
public long[] multiply(int[] poly1, int[] poly2) {

}
```

```
}
```

Python3:

```
class Solution:
def multiply(self, poly1: List[int], poly2: List[int]) -> List[int]:
```