2020/9/20 Problem - 1013

Residual Polynomial

Time Limit: 6000/3000 MS (Java/Others) Memory Limit: 524288/524288 K (Java/Others) Total Submission(s): 0 Accepted Submission(s): 0

Problem Description

Kanade has n polynomials $f_1(x) \dots f_n(x)$. These polynomials satisfy the following conditions:

1.
$$f_1(x) = \sum_{i=0}^n a_i x^i$$

2.
$$\forall i \in [2, n], f_i(x) = b_i(f_{i-1}(x))' + c_i f_{i-1}(x)$$

Given $a_0, a_1, \cdots, a_n, b_2, b_3, \cdots, b_n, c_2, c_3, \cdots, c_n$, Kanade wants to know $f_n(x)$

Because the coefficients of $f_n(x)$ may be very large, you only need to output them module 998244353

Input

There are T test cases.

The first line has 1 integer T.

Then for every test case:

The first line has 1 integer n.

The second line has n+1 integers $a_{0...n}$

The third line has n-1 integers $b_{2...n}$

The fourth line has n-1 integers $c_{2...n}$

 $1 \leq T \leq 100$

 $3 \leq n \leq 10^5$

 $0 \leq a_i, b_i, c_i < 998244353$

There are at most 3 test cases satisfy that $n>1000\,$

Output

For every test case, if $f_n(x) = \sum_{i=0}^n w_i x^i$, then output n+1 integers $w_{0...n}$ in a line and separate them by spaces.

Sample Input

```
3

3

0 0 0 0 1

1 1

4

1 1 1 1 1 1

1 2 1

2 3 2

5 3 4 5 6 5 4

4 1 6 0

6 9 2 7
```

Sample Output

```
0 6 6 1
66 166 204 92 12
37940 117264 204708 207256 60900 3024
```

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Hangzhou Dianzi University Online Judge 3.0
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