Problem F. Palindromic Polynomial

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

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A *palindromic polynomial* is a non-zero polynomial whose coefficients read the same in both directions.

Alan had a palindromic polynomial A of a degree $d \le 10^4$. He wrote down its values modulo $10^9 + 9$ in n distinct integer points. Then he lost the polynomial. Now he wants to restore it from the points. Help Alan find any palindromic polynomial of degree at most 10^4 which passes through all given points.

Formally, you are given a list of pairs $(x_1, y_1), (x_2, y_2) \dots (x_n, y_n)$, $0 \le x_i, y_i < 10^9 + 9$. Your task is to find any polynomial $A(x) = a_d x^d + a_{d-1}x^{d-1} + \dots + a_1 x + a_0$, such that:

- $0 \le d \le 10^4$ and $a_d \ne 0$;
- $0 \le a_i < 10^9 + 9$ for $i = 0 \dots d$;
- $A(x_i) \equiv y_i \pmod{10^9 + 9}$ for $i = 1 \dots n$;
- $a_i = a_{d-i}$ for $i = 0 \dots d$.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \le t \le 100$). The description of the test cases follows.

The first line of each test case contains an integer n ($1 \le n \le 10^3$) — the number of points.

The second line of each test case contains n distinct integers $x_1, x_2, \dots, x_n$ ($0 \le x_i < 10^9 + 9$).

The third line of each test case contains n integers $y_1, y_2, \dots y_n$ ($0 \le y_i < 10^9 + 9$).

It is guaranteed that the sum of n over all test cases does not exceed 10^3.

Output

For each test case, print -1 if there is no polynomial that satisfies all the conditions. Otherwise, on the first line print d — the degree of the found polynomial ($0 \le d \le 10^4$), and on the next line print $d + 1$ integers $a_0, a_1, \dots, a_d$ ($0 \le a_i < 10^9 + 9$, $a_d \ne 0$).

If there are multiple solutions, print any of them.

Example

standard input	standard output
8 2 0 1 2 4 3 0 1 2 2 10 36 4 0 1 2 3 1 4 9 16 5 0 1 2 3 4 1 25 961 14641 116281 2 2 500000005 5 375000004 2 2 500000005 5 375000004 2 2 500000005 1 2 3 2 500000005 3 5 375000004 10	1 2 2 3 2 3 3 2 2 1 2 1 8 1 2 3 4 5 4 3 2 1 3 1 666666672 666666672 1 3 1 666666672 666666672 1 -1 -1

Note

The polynomial of degree d has exactly $d+1$ coefficients, even though some of them may be zeros. The leading coefficient of a polynomial cannot be zero unless the polynomial is constant zero.

Hence, the following polynomials are palindromic:

- $A(x) = 2x^3 + 3x^2 + 3x + 2$ — coefficients are $[2, 3, 3, 2]$.
- $A(x) = 5x^4 + 10x^2 + 5$ — coefficients are $[5, 0, 10, 0, 5]$.
- $A(x) = x^4 + 1$ — coefficients are $[1, 0, 0, 0, 1]$.
- $A(x) = 1$ — coefficients are $[1]$.

The following polynomials are **not** palindromic:

- $A(x) = 2x^3 + 3x^2 + 3x + 1$ — coefficients are $[2, 3, 3, 1]$.
- $A(x) = 2x^4 + 3x^3 + 3x^2 + 2x$ — coefficients are $[2, 3, 3, 2, 0]$.
- $A(x) = x^5 + x$ — coefficients are $[1, 0, 0, 0, 1, 0]$.

As a special case, the polynomial $A(x) = 0$ does not satisfy condition $a_d \neq 0$ and will not be accepted as an an answer.

Also note that you **do not** need to minimize the degree of the polynomial.