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B. Gellyfish and Baby's Breath

time limit per test: 1 second
memory limit per test: 256 megabytes

Flower gives Gellyfish two permutations* of $[0, 1, \ldots, n-1]$: $p_0, p_1, \ldots, p_{n-1}$ and $q_0, q_1, \ldots, q_{n-1}$.

Now Gellyfish wants to calculate an array $r_0, r_1, \ldots, r_{n-1}$ through the following method:

- For all i $(0 \le i \le n-1)$, $r_i = \max\limits_{j=0}^{i} (2^{p_j} + 2^{q_{i-j}})$

But since Gellyfish is very lazy, you have to help her figure out the elements of r.

Since the elements of r are very large, you are only required to output the elements of r modulo $998\,244\,353$.

*An array b is a permutation of an array a if b consists of the elements of a in arbitrary order. For example, $[4, 2, 3, 4]$ is a permutation of $[3, 2, 4, 4]$ while $[1, 2, 2]$ is not a permutation of $[1, 2, 3]$.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \le t \le 10^4$). The description of the test cases follows.

The first line of each test case contains a single integer n $(1 \le n \le 10^5)$.

The second line of each test case contains n integers $p_0, p_1, \ldots, p_{n-1}$ $(0 \le p_i < n)$.

The third line of each test case contains n integers $q_0, q_1, \ldots, q_{n-1}$ $(0 \le q_i < n)$.

It is guaranteed that both p and q are permutations of $[0, 1, \ldots, n-1]$.

It is guaranteed that the sum of n over all test cases does not exceed 10^5.

Output

For each test case, output n integers $r_0, r_1, \ldots, r_{n-1}$ in a single line, modulo $998\,244\,353$.

Example

input Copy

```
3
3
0 2 1
1 2 0
5
0 1 2 3 4
4 3 2 1 0
10
5 8 9 3 4 0 2 7 1 6
9 5 1 4 0 3 2 8 7 6
```

output Copy

```
3 6 8
17 18 20 24 32
544 768 1024 544 528 528 516 640 516 768
```

Note

In the first test case:

- $r_0 = 2^{p_0} + 2^{q_0} = 1 + 2 = 3$
- $r_1 = \max(2^{p_0} + 2^{q_1}, 2^{p_1} + 2^{q_0}) = \max(1 + 4, 4 + 2) = 6$
- $r_2 = \max(2^{p_0} + 2^{q_2}, 2^{p_1} + 2^{q_1}, 2^{p_2} + 2^{q_0}) = (1 + 1, 4 + 4, 2 + 2) = 8$