C.O.B.E.N (Hard Version)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	10 seconds
Memory limit:	512 megabytes

This is the hard version of the problem. The only difference between the two versions is the time limit, constraints on n, and that ties are permitted. You can make hacks only if both versions of the problem are solved.

Amog the Mogger enters the **Moniforces** into a multiplayer Nim tournament. However, they don't know the optimal strategy and thus play no better than random.

You are given n players with their current scores $p_1, p_2, \ldots, p_n$ and n non-negative bonuses $s_1, s_2, \ldots, s_n$. In the next round, each player will randomly receive one of the bonuses. The player with the lowest total score after the round will be eliminated. **In the event of a tie for the lowest total score among k players, one of them is eliminated uniformly at random, with each having a probability of $\frac{1}{k}$.**

Your task is to calculate, for each player i, the exact probability of being eliminated after the next round, returned modulo 998244353.

Input

The first line contains t ($1 \leqslant t \leqslant 20$), the number of test cases.

Then, t test cases follow and for each test case:

The first line contains one integer, n ($1 \leqslant n \leqslant \mathbf{150}$)

The second line contains n space separated integers, where p_i ($0 \leqslant p_i \leqslant 10^9$) represents the current score of player i.

The third line contains n space separated integers, where s_i ($0 \leqslant s_i \leqslant 10^9$) represents the score bonus associated with i^{th} place.

It is guaranteed that the sum of n over all test cases will not exceed **150**.

Output

A single line containing n integers, space separated, where the i^{th} integer represents the probability mod 998244353 that player i is eliminated.

It can be shown that the expected value has the form $\frac{P}{Q}$, where P and Q are non-negative coprime integers, and $Q \neq 0$. Report the value of $P \cdot Q^{-1} \pmod{998244353}$.

Example

standard input	standard output
3 3 60 40 20 100 50 25 6 7495 4929 5117 6657 5763 7521 5767 4037 2833 2307 1730 1442 2 3 4 5 4	166374059 332748118 499122177 0 58230921 58230921 144190851 737591661 0 249561089 748683265

Note

We have 3 players with current scores $p = [60, 40, 20]$ and bonus options $s = [100, 50, 25]$. There are $3! = 6$ ways to assign the 3 bonuses, and in each assignment, the player with the lowest total $(p_i + s_{\pi(i)})$ is eliminated. Enumerating:

1. $[160, 90, 45] \to$ Player 3 is eliminated.
2. $[160, 65, 70] \to$ Player 2 is eliminated.
3. $[110, 140, 45] \to$ Player 3 is eliminated.
4. $[110, 65, 120] \to$ Player 2 is eliminated.
5. $[85, 140, 45] \to$ Player 3 is eliminated.
6. $[85, 90, 120] \to$ Player 1 is eliminated.

Player 1 is eliminated in 1 of 6 permutations ($\frac{1}{6}$).

Player 2 is eliminated in 2 of 6 permutations ($\frac{1}{3}$).

Player 3 is eliminated in 3 of 6 permutations ($\frac{1}{2}$).

A tie is possible for the last test case; if we allocate the score bonus 5 to player 1 and the score bonus 4 to player 2, both end with a total score of 8. Therefore, we begin the procedure and uniformly pick one of them at random, which means they each have a $\frac{1}{2}$ chance of being eliminated if those score bonuses are allocated in that manner. The probabilities of elimination over all permutations are $\frac{3}{4}$ for player 1 and $\frac{1}{4}$ for player 2.