

Problem K

Locker Riddle II

Time limit: 1s
Memory limit: 1GB

Locker Riddle I

A room contains n lockers, numbered from 1 to n . Each locker is either open or closed. A group of n heirs must solve a puzzle with these lockers before they can receive their inheritance.

The heirs are also numbered from 1 to n . In each step, you may choose one heir to perform an operation. When the i -th heir is chosen, they flip the state of every locker whose index is a multiple of i . More precisely, for every positive integer j such that $i \times j \leq n$, the state of the $(i \times j)$ -th locker is changed from open to closed or vice versa. An heir may be chosen more than once.

The puzzle is solved when all n lockers are closed.

Find a sequence of operations that closes all the lockers, or determine that no such sequence exists.

This problem is a randomized variant of the puzzle above.

The setting and rules are the same as in **Locker Riddle I**, except that you can no longer choose which heir performs each operation. At each step, exactly one heir is chosen at random. The i -th heir is chosen with probability r_i . The choices made in different steps are independent. The process stops as soon as all lockers are closed; if they are initially all closed, no operations are performed.

Find the expected number of operations performed, including the one after which all lockers are closed.

Input

- The first line contains a single integer t ($1 \leq t \leq 100$), the number of test cases.
- For each test case:
 - The first line contains two integers n and S ($1 \leq n \leq 100$, $n \leq S \leq 100$), the number of lockers and the sum of all probability weights.
 - The second line contains n integers $a_1, a_2, \dots, a_n$ ($0 \leq a_i \leq 1$), the initial states of the lockers, where $a_i = 1$ means the i -th locker is open and $a_i = 0$ means it is closed.
 - The third line contains n integers $p_1, p_2, \dots, p_n$ ($1 \leq p_i \leq S$, $\sum_{i=1}^n p_i = S$), where the i -th heir is chosen with probability $r_i = \frac{p_i}{S}$ at each step.

Output

For each test case, print the expected number of operations modulo 998244353, as defined below.

It can be proved that the expected number of operations is always a rational number. Also, under the constraints of this problem, it can be proved that if this rational number is represented as an irreducible

fraction $\frac{P}{Q}$, then $Q \not\equiv 0 \pmod{998244353}$. Therefore, there uniquely exists an integer R such that $R \times Q \equiv P \pmod{998244353}$ and $0 \leq R < 998244353$. Print this R .

Sample Input	Sample Output
8 3 3 0 0 0 1 1 1 3 3 0 0 1 1 1 1 3 3 0 1 0 1 1 1 3 3 0 1 1 1 1 1 3 3 1 0 0 1 1 1 3 3 1 0 1 1 1 1 3 3 1 1 0 1 1 1 3 3 1 1 1 1 1 1	0 7 7 9 10 9 9 7
3 7 67 1 0 0 0 0 1 1 6 7 6 7 6 7 28 11 12 1 1 1 1 1 1 0 1 0 1 0 2 1 1 1 1 1 1 1 1 1 1 15 15 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	482862219 84701850 32767

Notes

In the first test case of the first example, all lockers are already closed, so the process stops immediately and the answer is 0.

In the second test case of the first example, only locker 3 is open. If heir 3 is chosen first, which happens with probability $\frac{1}{3}$, the puzzle is solved in one operation. Other choices open additional lockers and require further operations. Taking all possible random sequences into account, the expected number of operations is 7.

In the first test case of the second example, the expected number of operations is $\frac{48413814955469214029}{259441760155978400}$.