Recursive Sequence

Sequence (a_i) of natural numbers is defined as follows:

$a_i = b_i$ (for $i <= k$)
$a_i = c_1 a_{i-1} + c_2 a_{i-2} + ... + c_k a_{i-k}$ (for $i > k$)

where b_j and c_j are given natural numbers for $1<=j<=k$. Your task is to compute a_n for given n and output it modulo 10^9.

Input

On the first row there is the number C of test cases (equal to about 1000).
Each test contains four lines:

k - number of elements of (c) and (b) ($1 <= k <= 10$)
$b_1,...,b_k$ - k natural numbers where $0 <= b_j <= 10^9$ separated by spaces
$c_1,...,c_k$ - k natural numbers where $0 <= c_j <= 10^9$ separated by spaces
n - natural number ($1 <= n <= 10^9$)

Output

Exactly C lines, one for each test case: a_n modulo 10^9

Example

Input:

```
3
3
5 8 2
32 54 6
2
3
1 2 3
4 5 6
6
3
24 354 6
56 57 465
98765432
```

Output:

```
8
714
257599514
```