

Recursive Sequence (Version II)

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

$$a_i = b_j \text{ (for } i \leq k)$$

$$a_i = c_1 a_{i-1} + c_2 a_{i-2} + \dots + c_k a_{i-k} \text{ (for } i > k)$$

where b_j and c_j are given natural numbers for $1 \leq j \leq k$. Your task is to compute $a_m + a_{m+1} + a_{m+2} + \dots + a_n$ for given $m \leq n$ and output it modulo a given positive integer p .

Input

On the first row there is the number C of test cases (equal to about 50).

Each test contains four lines:

k - number of elements of (c) and (b) ($1 \leq k \leq 15$)

b_1, \dots, b_k - k natural numbers where $0 \leq b_j \leq 10^9$ separated by spaces

c_1, \dots, c_k - k natural numbers where $0 \leq c_j \leq 10^9$ separated by spaces

m, n, p - natural numbers separated by spaces ($1 \leq m \leq n \leq 10^{18}$, $1 \leq p \leq 10^8$)

Output

Exactly C lines, one for each test case: $(a_m + a_{m+1} + a_{m+2} + \dots + a_n)$ modulo p .

Example

Input:

```
1
2
1 1
1 1
2 10 1000003
```

Output:

```
142
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