Recurrence

Let $F_0 = 1$. $F_n = a*F_{n-1} + b$ for $n >= 1$. Find F_n (mod M).

Input

The first line contains T the number of test cases. Each of the next T lines contains 4 space seperated integers a, b, n and M.

Constraints

T <= 20000
$0 <= a, b, n <= 10^{100}$
1 <= M <= 100000

Output

Output T lines, one corresponding to each test case.

Example

Input:
3
1 1 1 10
2 1 2 5
5 2 20 30

Output:
2
2
7