

Black Hole

Given integers n, a, b and M , calculate the value $\sum_{k=0}^n k^a b^k$ modulo M .

Input Format

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

Output Format

For each test case output one integer: the value of the sum.

Note In this problem we take $0^0 = 1$

Constraints

- $1 \leq T \leq 6^6 + 6$
 - $0 \leq n \leq 10^{18}$
 - $0 \leq a \leq 777$
 - $0 \leq |b| \leq 10^{18}$
 - $1 \leq M \leq 10^9$
- The sum of all a in one test file doesn't exceed 1000

Sample input

```
5
3 1 1 100
3 0 1 100
3 1 0 100
44 44 4 444
77 7 47 747
```

Sample Output

```
6
4
0
288
288
```

Explanation

$$\begin{aligned} 0^1 \times 1^0 + 1^1 \times 1^1 + 2^1 \times 1^2 + 3^1 \times 1^3 &= 0 + 1 + 2 + 3 = 6 \\ 0^0 \times 1^0 + 1^0 \times 1^1 + 2^0 \times 1^2 + 3^0 \times 1^3 &= 1 + 1 + 1 + 1 = 4 \\ 0^1 \times 0^0 + 1^1 \times 0^1 + 2^1 \times 0^2 + 3^1 \times 0^3 &= 0 + 0 + 0 + 0 = 0 \end{aligned}$$