G - Sum of Pow of Mod of Linear

Editorial (/contests/abc429/tasks/abc429_g/editorial)

Time Limit: 4 sec / Memory Limit: 1024 MiB

Score : 625 points

Problem Statement

You are given integers N, M, A, B, X, R.

Find the remainder when $\displaystyle\sum_{k=0}^{N-1} X^{(Ak+B) \bmod M}$ is divided by R.

You are given T test cases, so find the answer for each of them.

Constraints

- $1 \leq T \leq 100$
- $1 \leq N, M, R \leq 10^9$
- $0 \leq A, B < M$
- $1 \leq X < R$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{array}{l}
T \\
\mathrm{case}_1 \\
\mathrm{case}_2 \\
\vdots \\
\mathrm{case}_T
\end{array}
$$

Each test case case_i is given in the following format:

$$
N \quad M \quad A \quad B \quad X \quad R
$$

Output

Print T lines.

On the i-th line, print the remainder when $\sum_{k=0}^{N-1} X^{(Ak+B) \bmod M}$ is divided by R for the i-th test case.

Sample Input 1

Copy

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```
3
4 5 2 1 2 1000000000
777 429 33 58 1 1000000000
20251025 429429 777 1025 575757 998244353
```

Sample Output 1

Copy

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```
15
777
445271630
```

Consider the first test case.

- When $k = 0$: $X^{(Ak+B) \bmod M} = 2^{(2\times0+1) \bmod 5} = 2^1 = 2.$
- When $k = 1$: $X^{(Ak+B) \bmod M} = 2^{(2\times1+1) \bmod 5} = 2^3 = 8.$
- When $k = 2$: $X^{(Ak+B) \bmod M} = 2^{(2\times2+1) \bmod 5} = 2^0 = 1.$
- When $k = 3$: $X^{(Ak+B) \bmod M} = 2^{(2\times3+1) \bmod 5} = 2^2 = 4.$

From the above, the desired value is the remainder when $2+8+1+4$ is divided by 1000000000, which is 15. Therefore, print 15 on the 1st line.

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