Project Euler #242: Odd Triplets

This problem is a programming version of Problem 242 from projecteuler.net

Given the set $\{1, 2, \ldots, n\}$, we define $f_{m,r}(n, k)$ as the number of its k-element subsets whose sum of elements is congruent to r modulo m. For example, $f_{2,1}(5, 3) = 4$, since the set $\{1, 2, 3, 4, 5\}$ has four 3-element subsets having an odd sum of elements, i.e.: $\{1, 2, 4\}$, $\{1, 3, 5\}$, $\{2, 3, 4\}$ and $\{2, 4, 5\}$.

Given integers m, r, n, k and M, find $m \times f_{m,r}(n, k)$ modulo M.

Input Format

The only line of each testfile contains five space-separated integers: m, r, n, k and M.

Constraints

- $2 \leq m \leq 10^{11}$.
- $0 \leq r < m$.
- $1 \leq k \leq n \leq 10^{18}$.
- For each positive divisor d of m: $n \pmod d \leq k \pmod d$.
- $2 \leq M \leq 2^{62}$.
- The largest prime factor of M is less than 10^5.

Output Format

Print a single integer denoting $(m \times f_{m,r}(n, k)) \pmod M$

Sample Input 0

```
20 12 20 10 243
```

Sample Output 0

```
63
```

Sample Input 1

```
6 0 40 28 1024
```

Sample Output 1

```
758
```

Sample Input 2

```
74 4 75 3 638976
```

Sample Output 2

```
67562
```

Sample Input 3

```
999952 976999 716281831 594438575 4559755227955200000
```

Sample Output 3

```
1709908210483200000
```