Coprime Power Sum

HackerRank

Given two integers, m and k, Alice loves to calculate their power sum using the following formula:

$$PowerSum(m,k) \equiv \sum_{i=1}^{m} i^k$$

Bob has a set, s, of n distinct *pairwise coprime* integers. Bob hates multiples of these integers, so he subtracts i^k from Alice's power sum for each $i \in [1,m]$ whenever there exists at least one $j \in [1,n]$ such that $i \bmod s_j \equiv 0$.

Alice and Bob are now confused about the final value of the power sum and decide to turn to Eve for help. Can you write a program that helps Eve solve this problem? Given q queries consisting of n, m, and k, print the value of the power sum modulo 10^9+7 on a new line for each query.

Input Format

The first line contains an integer, q, denoting the number of queries. The $2 \cdot q$ lines describe each query over two lines:

1. The first line contains three space-separated integers denoting the respective values of n (the number of integers in Bob's set), k (the exponent variable in the power sum formula), and m (the upper range bound in the power sum formula).
2. The second line contains n distinct space-separated integers describing the respective elements in set s.

Constraints

- $1 \le q \le 2$
- $1 \le n \le 50$
- $0 \le k \le 10$
- $1 \le m \le 10^{12}$
- $1 \le s_j \le 10^{12}$
- $s_i \ne s_j$, where $i \ne j$
- $gcd(s_i, s_j) \equiv 1$, where $i \ne j$

Output Format

For each query, print the resulting value of the power sum after Bob's subtraction, modulo 10^9+7.

Sample Input

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2
2 1 10
2 3
```

```
3 2 18
4 13 9
```

Sample Output

```
13
1055
```

Explanation

We perform the following $q = 2$ queries:

1. Alice first calculates the sum $1^1 + 2^1 + \ldots + 10^1 = 55$. Bob's set contains 2 and 3 only, so he subtracts the power of all numbers that are multiples of 2 and/or 3 from Alice's sum to get: $55 - 2^1 - 3^1 - 4^1 - 6^1 - 8^1 - 9^1 - 10^1 = 13$. We then print the result of $13 \bmod (10^9 + 7) = 13$ on a new line.

2. Alice first calculates the sum $1^2 + 2^2 + \ldots + 18^2 = 2109$. Bob then subtracts multiples of 4, 9, and 13 from Alice's sum to get: $2109 - 4^2 - 8^2 - 9^2 - 12^2 - 13^2 - 16^2 - 18^2 = 1055$. We then print the result of $1055 \bmod (10^9 + 7) = 1055$ on a new line.