A Math Contest P17 - Heatwaves

Time limit: 7.0s **Memory limit:** 512M

You are given an integer $N > 2$ and a function $\chi : \mathbb{Z} \to \mathbb{C}$ such that

1. $\chi(n) = \chi(n + N)$;
2. $\chi(n) = 0 \iff \gcd(n, N) \neq 1$;
3. $\chi(n)\chi(m) = \chi(nm)$;
4. the nonzero values of χ has period $\varphi(N)$.

Consider the unique function $L_\chi(s) : \mathbb{C} \to \mathbb{C}$ such that

1. when $\mathrm{Re}(s) > 1$, then $L_\chi(s) = \sum_{n=1}^{\infty} \frac{\chi(n)}{n^s}$;
2. $L_\chi(s)$ is differentiable everywhere.

Find

1. $L_\chi(s)$ for a given complex number s;
2. a complex number s with a nonzero imaginary part such that $L_\chi(s) = 0$.

▶ You are further informed that

Constraints

$2 < N \leq 1\,000$

$0 \leq \mathrm{Re}(s) \leq 1$ and $|\mathrm{Im}(s)| \leq 5$

$x \in \{0, 1\}$ and $0 \leq y \leq 2z \leq 10^9$ and $1 \leq z$

For the first question, the jury answer is precise to 10^{-50}, and the magnitude of the difference between your answer and the jury answer should be less than 10^{-12}.

For the second question, the checker is precise to 10^{-15}, and the magnitude of $L_\chi(s)$ of your answer should be less than 10^{-9}.

Input Specification

The first line contains an integer, N.

The next N lines contain three nonnegative integers x, y, and z each, representing $\chi(0), \chi(1), \ldots, \chi(N-1)$ respectively. The three integers x, y, z correspond to $xe^{yi\pi/z}$.

The next line contains two real numbers, with at most 5 digits after the decimal point, representing the real and imaginary parts of s.

Output Specification

On the first line, output the real and imaginary parts for the first answer.

On the second line, output the real and imaginary parts for the second answer.

Sample Input

```
5
0 0 1
1 0 2
1 1 2
1 3 2
1 2 2
0.69 4.2069
```

Sample Output

```
1.5186663729999338699 -0.8641952653252008201
0.5000000000000000000 6.1835781954508539144
```

Explanation for Sample