Project Euler #192: Best Approximations

This problem is a programming version of Problem 192 from projecteuler.net

Let x be a real number. A best approximation to x for the denominator bound d is a rational number $\frac{r}{s}$ in reduced form, with $s \leq d$, such that any rational number which is closer to x than $\frac{r}{s}$ has a denominator larger than d:

$$|\frac{p}{q} - x| < |\frac{r}{s} - x| \implies q > d$$

For example, the best approximation to $\sqrt{13}$ for the denominator bound 20 is $\frac{18}{5}$ and the best approximation to $\sqrt{13}$ for the denominator bound 30 is $\frac{101}{28}$.

Find the sum of all denominators of the best approximations to $\sqrt{n}$ for the denominator bound b, where n is not a perfect square and $1 < n \leq m$.

Input Format

The only line of each test file contains two integer numbers: m and b.

Constraints

- $2 \leq m \leq 15 \times 10^5$
- $2 \leq b \leq 10^{18}$

Output Format

Print exactly one number which is the answer to the problem modulo $1000000016000000063 = (10^9 + 7) \times (10^9 + 9)$

Sample Input 0

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3 10
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Sample Output 0

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12
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Explanation 0

The best approximation to $\sqrt{2}$ is $\frac{7}{5}$. The best approximation to $\sqrt{3}$ is $\frac{12}{7}$. $5 + 7 = 12$.