

# 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  $d$ :

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

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  $10000000160000000063 = (10^9 + 7) \times (10^9 + 9)$

## Sample Input 0

```
3 10
```

## Sample Output 0

```
12
```

## Explanation 0

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