Problem A. Sieve It!

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	512 mebibytes

For a positive integer n define following functions:

- $d(n)$ — minimal divisor of n greater than 1, put $d(1) = 0$ by definition.
- $s_0(n)$ — number of different divisors of n.
- $s_1(n)$ — sum of all divisors of n.
- $\varphi(n)$ — totient Euler function, the number of integers k such that $1 \le k \le n$ and $GCD(n, k) = 1$.

Given integer n, calculate $\sum_{k=1}^{n} d(k)$, $\sum_{k=1}^{n} s_0(k)$, $\sum_{k=1}^{n} s_1(k)$ and $\sum_{k=1}^{n} \varphi(k)$.

Input

The only line of input contains integer n ($1 \le n \le 10^7$).

Output

Print four space-separated numbers: $\sum_{k=1}^{n} d(k)$, $\sum_{k=1}^{n} s_0(k)$, $\sum_{k=1}^{n} s_1(k)$ and $\sum_{k=1}^{n} \varphi(k)$.

Examples

standard input	standard output
10	28 27 87 32

Problem B. Cabbages Under Hyperbola

Input file:	*standard input*
Output file:	*standard output*
Time limit:	6 seconds
Memory limit:	512 mebibytes

Farmer John has bought a patch of field. The patch consists of several cells on the rectangular grid. Farmer John introduced coordinate system with axes aligned to grid lines. For any integers x and y, a cell (x, y) belongs to Farmer John's field if $x > 0$, $y > 0$ and $xy \leq n$.

Farmer John wants to choose a rectangular piece of his field and plant it with cabbages. Borders of the piece must lie on the grid lines. Of course, all cells inside the chosen piece must belong to Farmer John's field, and the piece must have positive area.

Help Farmer John count the number of different pieces he can plant with cabbages.

Input

The only line of input contains one integer n ($1 \leq n \leq 10^{15}$).

Output

Print one integer — the number of ways to choose a rectangular piece of field, modulo $10^9 + 7$.

Examples

standard input	standard output
2	5
4	23

Problem C. Coprime Tuples

Input file:	*standard input*
Output file:	*standard output*
Time limit:	7 seconds
Memory limit:	512 mebibytes

Consider a tuple of integers $(a_1, \ldots, a_k)$, where each a_i satisfies $1 \le a_i \le n$. How many such tuples exist with $GCD(a_1, \ldots, a_k) = 1$?

Input

The only line of input contains two space-separated integers n and k ($1 \le n, k \le 10^{11}$).

Output

Print the answer modulo $10^9 + 7$.

Examples

standard input	standard output
3 2	7
5 5	3091

Problem D. Count The Semiprimes

Input file:	*standard input*
Output file:	*standard output*
Time limit:	12 seconds
Memory limit:	512 mebibytes

A positive integer m is called a *semiprime* if it is a product of two different primes p and q.

Count the number of semiprimes not exceeding n.

Input

The only line of input contains the integer n ($1 \le n \le 10^{11}$).

Output

Print the number of semiprimes not exceeding n.

Examples

standard input	standard output
50	13

Note

The semiprimes not exceeding 50 are 6, 10, 14, 15, 21, 22, 26, 33, 34, 35, 38, 39, and 46.