



ICPC International Collegiate Programming Contest  
**The 2025 ICPC North America  
Championship**



22-27 May 2025

**ICPC NAC 2025**

Orlando, Florida

# Problem A

## A Totient Quotient

Time Limit: 1 Second, Memory Limit: 2G

For a positive integer  $k$ , Euler's totient function  $\phi(k)$  is defined as the number of positive integers less than or equal to  $k$  and relatively prime to  $k$ . For example,  $\phi(9) = 6$ ,  $\phi(24) = 8$ , and  $\phi(1) = 1$ . (As a reminder, the greatest common divisor (gcd) of two positive integers  $a$  and  $b$  is the greatest positive integer that divides both  $a$  and  $b$ . Two positive integers are relatively prime if their gcd is 1.)

Euler's product formula gives the value of  $\phi(k)$  in terms of the prime factorization of  $k$ . For a prime  $p$ , let  $\nu_p(k)$  be the highest power of  $p$  which divides  $k$  (so for example,  $\nu_2(48) = 4$ ,  $\nu_3(48) = 1$ , and  $\nu_5(48) = 0$ ). If  $k$  is a product of powers of prime factors,  $k = \prod_{i=1}^j p_i^{\nu_{p_i}(k)}$  (where the product only includes primes  $p_i$  with  $\nu_{p_i}(k) > 0$ ), then

$$\phi(k) = \prod_{i=1}^j \left[ (p_i - 1) \left( p_i^{\nu_{p_i}(k)-1} \right) \right].$$

A recent edition of The American Mathematical Monthly (Li et al., *Positive Rational Numbers of the Form  $\phi(m^2)/\phi(n^2)$* , 128(2), 2021) proved the following fact about totient quotients: for any pair of positive integers  $a, b$  there is a unique pair of positive integers  $m, n$  for which:

1.  $\frac{a}{b} = \frac{\phi(m^2)}{\phi(n^2)}$ ;
2. if a prime  $p$  divides the product  $mn$ , then  $\nu_p(m) \neq \nu_p(n)$ ;
3.  $\gcd(m, n)$  is square-free: that is, for every prime  $p$ ,  $\gcd(m, n)$  is not divisible by  $p^2$ .

Conditions 2 and 3 guarantee that  $m$  and  $n$  are the unique smallest pair of positive integers satisfying condition 1.

You'd like to verify this claim numerically. Write a program which takes as input two integers  $a$  and  $b$  and outputs the corresponding pair  $m, n$ .

### Input

The only line of input contains two space-separated integers  $a$  and  $b$  ( $1 \leq a, b \leq 10\,000$ ). These two integers are guaranteed to be relatively prime. Additionally,  $a$  and  $b$  will be chosen so that output values  $m$  and  $n$  are less than  $2^{63}$ .



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## Output

Print the two positive integers  $m$  and  $n$  satisfying all three of the conditions of The American Mathematical Monthly's theorem, separated by a space. It is guaranteed that  $m, n < 2^{63}$ .

**Sample Input 1**

9 13	18 13
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**Sample Output 1**

**Sample Input 2**

19 47	13110 18612
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**Sample Output 2**