

## Divisor Summation Example

**Question:** What is the sum of the divisors of 10125?

**Solution:**

First, obtain the prime factorization of 10125 (by successive division). Its prime factorization turns out to be  $3^4 5^3$ .

We will use the formula for the sum of an initial segment of a geometric progression.

The divisors of  $3^4 5^3$  are the terms in the sum when

$(1 + 3 + 9 + 27 + 81)(1 + 5 + 25 + 125)$  is multiplied out, and therefore their sum, which we will call  $s$ , is equal to this sum.

$$\begin{aligned} \text{Thus, } s &= \left( \sum_{k=1}^5 3^{k-1} \right) \left( \sum_{k=1}^4 5^{k-1} \right) \\ &= \left( \frac{3^5 - 1}{3 - 1} \right) \left( \frac{5^4 - 1}{5 - 1} \right) = \left( \frac{242}{2} \right) \left( \frac{624}{4} \right) \\ &= 121 \times 156 = 18876 \end{aligned}$$

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