

# Project Euler: Problem 47

Nathan Marianovsky

**Problem** (Distinct Primes Factors). The first two consecutive numbers to have two distinct prime factors are:

$$14 = 2 \times 7$$

$$15 = 3 \times 5$$

The first three consecutive numbers to have three distinct prime factors are:

$$644 = 2^2 \times 7 \times 23$$

$$645 = 3 \times 5 \times 43$$

$$646 = 2 \times 17 \times 19$$

Find the first four consecutive integers to have four distinct prime factors. What is the first of these numbers?

**Solution.** The basic approach is to take consecutive integers and break them down into their prime factorization:

$$a = p_1^{m_1} p_2^{m_2} \dots p_k^{m_k}$$

and count the number of distinct primes. Lets say to generalize that you want to find the first set of  $k$  integers that have  $k$  distinct prime factors, you check the current  $k$  integers to see if they all meet the requirement, if not, move each one over by one and check again. Repeat the checking process until a result has popped up.