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 consectuive 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 approach is to take consecutive integers and break them down into their prime factorization [1]:

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

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.

---

[1]See the personal comments for problem 3 for a proof of the Fundamental Theorem of Arithmetic