The Next Prime Number

A. W. Draut

30 Apr 2013

Abstract

Let p_i be the i_{th} prime number. Given the first n primes, we construct p_{n+1} as follows.

Let $\lambda_n = \prod_{i=1}^{n} p_i$, i.e., the product of the first n primes. We prove that the second smallest member of the reduced residue system of λ_n is p_{n+1}.

The construction of the reduced residue system of λ_n is time consuming and we present algorithms for doing so. Here we make use of structures that we call Eratosthenes patterns, derived from the sieve of Eratosthenes.