numnums

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congruence

primality

divisability

basis-representation

- THEOREM:

  Let k be any integer larger than 1. Then, for each positive integer n, there exists a representation
  $n = a_0 k^s + a_1 k^{s-1} + \ldots + a_s$
  where $a_0 \neq 0$, and where each a_i is nonnegative and less than k.
  This representation of n is unique.
  It is known as the representation of n to the base k.

- PROOF: Let $b_k(n)$ be the number of representations of n to the base k. We need to show that $b_k(n) = 1$ and only 1.

  Some of the coefficients a_i, can be equal to zero for a particular representation of n. But that doesn't effect the representation,so we will exclude terms that are zero.
  suppose : $n = a_0 k^s + a_1 k^{s-1} + \ldots + a_{s-t} k^t$,
  neither a_0 or $a_{s-t} = 0$. So subtracting 1 from n gives,
  $n\text{-}1 = a_0 k^s + a_1 k^{s-1} + \ldots + a_{s-t} k^t\text{-}1$
  $n\text{-}1 = a_0 k^s + a_1 k^{s-1} + \ldots + (a_{s-t}\text{-}1)k^t + k^t - 1$
  Since $\sum_{j=0}^{n-1} x^j = \{\frac{}{x}^{n-1}\}\{n\text{-}1\}$
  $n\text{-}1 = a_0 k^s + a_1 k^{s-1} + \ldots + (a_{s-t}\text{-}1)k^t + \sum_{j=0}^{t-1}(k\text{-}1)k^j$

fundatmental-theorem-of-arithmatic