There are $2^n$ possible binary strings. These strings can be either periodic, which contain repeating substrings, or aperiodic, which do not. Let $a_n$ represent the number of aperiodic strings of length $n$. We showed that the number of periodic strings of length $n$ is equal to $\sum_{d|n, d<n} a_d$ so that $a_n$ is given by the recursive formula $a_n = 2^n - \sum_{d|n, d<n} a_d$. We also proved that for $n > 2$, $a_n$ is divisible by 6, and that as $n$ approaches infinity, the ratio of adjacent terms $\frac{a_{n+1}}{a_n}$ approaches 2. We then derived explicit formulas for $a_n$ for specific cases of $n$, such as prime numbers, power of primes, and product of distinct primes. We also extended the idea to strings that contain more than two symbols. (Received September 16, 2013)