

Restricted Partitions as a Number Theory Problem and an NP-Complete Problem

The goal of this research is to study restricted partitions through the use of computers and programming. In particular, this paper focuses on counting the number of partitions for a number n where the smallest part of the partition is some number m . This partition counting problem is a member of the set of NP-Complete problems whose solutions are easy to verify but hard to generate. If NP-Complete problems could be solved, computers would be more useful. Research of this NP-Complete problem is important because every NP-Complete problem can be rewritten as any other NP-Complete problem, and solving one problem efficiently will allow all of the other problems to be solved efficiently. Software written using the C programming language was used to analyze patterns that could be used to simplify calculating the number of unique restricted partitions for a given number. Calculating the number of restricted partitions can be simplified by using a recurrence relation to represent the count of restricted partitions as a sum of the counts of unrestricted partitions that can be calculated from pentagonal numbers. This eliminates one of the two levels of recursion needed to calculate the number of restricted partitions, thus making the calculation more efficient. The methods discussed in this paper make it possible to calculate the number of unique partitions for a number n with a least part of exactly m as long as m is sufficiently small.