

# Problem 76 - Counting Summations

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*This document originally appeared as a blog post on my website. Find it at [gautammanohar.com/euler/76](http://gautammanohar.com/euler/76).*

## 1 Problem Statement

It is possible to write 5 as the sum of at least two positive integers in exactly 6 different ways:

$$\begin{aligned} 5 &= 4 + 1 \\ &= 3 + 2 \\ &= 3 + 1 + 1 \\ &= 2 + 2 + 1 \\ &= 2 + 1 + 1 + 1 \\ &= 1 + 1 + 1 + 1 + 1 \end{aligned}$$

How many ways can  $N$  be written as the sum of at least two positive integers? Report your answer modulo  $10^9 + 7$ .

## 2 My Algorithm

Please see my solution to [Project Euler 31](#), as we use the same dynamic programming techniques. This problem is a variant on the coin sum problem in Euler 31. This time, the coins have values  $1, 2, \dots, N$ .

At the end, we subtract 1 to exclude the vacuous sum which is just  $N$  itself, and then we report our answer modulo  $P$ . Our solution has time complexity  $O(N^2 + T)$ .