

Problem 48 - Self Powers

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This document originally appeared as a blog post on my website. Find it at gautammanohar.com/euler/48.

1 Problem Statement

The sum $1^1 + 2^2 + \cdots + 10^{10} = 10405071317$. Find the last ten digits of

$$\sum_{n=1}^N n^n. \tag{1}$$

2 My Algorithm

This problem is a simple bignum computation. Because we only need the last ten digits, it suffices to carry out all calculations modulo 10^{10} . In particular, we use modular exponentiation. This solution has time complexity $O(N \log N)$.