Fermat’s Last Theorem (FLT), stated by Pierre de Fermat in 1637, asserts no three positive integers $a$, $b$, $c$, can satisfy the equation $a^n + b^n = c^n$ for any integer value of $n$ greater than two. In 1846, Ernst Eduard Kummer proved FLT for regular primes. This was a major breakthrough and established FLT for all $n$ up to 100 with the exceptions of 37, 59, and 67. In doing so, Kummer had to develop number theory in the ring of cyclotomic integers, which was a major step in the development of the branch of mathematics called algebraic number theory. The goal of my research project is to provide a formal verification of Kummer’s proof using the proof assistant Isabelle. Isabelle is a computer system used to verify the correctness of a formal proof.

By providing this formal verification we will not only certify the correctness of the proof but we will contribute to the growing body of formally developed mathematics by submitting the proof and the formal mathematics required to prove it into the library of Archives of Formal Proofs.