The Kochen-Specker Theorem reduces Bell's argument on the noncontextuality of observables in quantum mechanics to a proof using a set of 117-three dimensional vectors in Hilbert space with no Kochen-Specker (KS) coloring. Since then, several KS uncolorable vector sets have been constructed, including rank-1 projection matrices with entries in the rational subring \mathbb{Z}[1/462] found by Cortez and Reyes. However, the iterative process used to generate the set of vectors S(462) is computationally expensive for proving whether sets of vectors such as S(6) are KS uncolorable. To reduce the runtime of this procedure, we develop an algorithm that replaces some iterative processes with Python functions with at most O(n) complexity. Furthermore, we leverage methods that solve Diophantine equations of the form i^{2} + j^{2} + k^{2} = N to more efficiently construct the necessary orthogonal basis vectors. By implementing this algorithm, we are able to identify a contradiction in our proof earlier on and minimize the possibility that the procedure does not halt.