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 a set of vectors whose rank-1 projection matrices have entries in the rational subring $\mathbb{Z}[1/462]$ found by Cortez and Reyes. The vectors that were generated correspond to the set $\mathcal{S}(N)$, for $N = 462$, which is defined as a subset of $\mathbb{Z}^3$ that contains vectors whose norm squared divides a power of N. However, certain iterative processes used to generate the set of vectors $\mathcal{S}(462)$ is computationally expensive for proving whether sets of vectors such as $\mathcal{S}(6)$ 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.