



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Mark Holmstrom; Theresa McLaughlin	Project Number S1410
Project Title Neighbors with Prescribed Prime Factors	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals To formulate a new method that is more efficient than that of Lehmer and still creates a relatively thorough solution set.</p> <p>Methods/Materials An initial set is augmented with new solutions found by a simple procedure. We then repeat this procedure to further augment the set until no new solutions arise. The process ends when no more solutions are found through combination of any two numbers in the set.</p> <p>Results We performed our process with a maximal prime factor of 163 where as Lehmer's method only reached a prime factor of 41. We found 115,207 solutions to our equation. The largest solution we found was 19,316,158,377,073,923,834,000, though it may be possible to find a larger solution if we used a higher maximal prime.</p> <p>Conclusions/Discussion Our new method creates solutions to Lehmer's equation that he was unable to find through his exhaustive methods. Work on the ABC Conjecture relates back to many other conjectures and theorems, such as Fermat's Last Theorem, Roth's Theorem, and the Mordell Conjecture. These findings are specific to set of numbers that fit the limitations of the ABC Conjecture and Lehmer's equation.</p>	
Summary Statement In our project, we developed a more efficient method to solve an equation in comparison to a possible solution proposed by D. H. Lehmer in 1964.	
Help Received Dr. Conrey of the American Institute of Mathematics helped us in the technical side of our project and allowed us to use his house as a research base.	