



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) David K. Legg	Project Number S1414
Project Title Computerized Deductive Reasoning Using Bipartite Rules	
Abstract Objectives/Goals My objective is to determine if automatically manipulating bipartite rules is an effective way to perform deductive logic. Methods/Materials A self-modifying system of rules was set up, with support for #grid puzzles# added. 36 puzzles, varying in size and difficulty, were selected at random and translated into an appropriate form for the program to interpret. The computer ran the algorithm for each puzzle, and data about completeness, accuracy, and time taken to reach a conclusion were recorded. Results The algorithm never made an incorrect deduction, though it sometimes failed to make enough deductions to complete a puzzle. It solved 61% of puzzles completely, averaging 4.5 seconds per puzzle. Conclusions/Discussion The algorithm successfully applied deductive logic, reaching correct conclusions in times that were reasonable. The bipartite rule structure is an effective way to implement deductive logic. Furthermore, it mirrors the way humans perform comparable logic tasks, as they use similar structures naturally. I plan on adding functionality to handle transitive logic and other more complex manipulations, which should increase the solve rate, especially for more difficult puzzles.	
Summary Statement I created an algorithm that manipulates bipartite rules according to the conventions of formal logic in order to perform deductive reasoning.	
Help Received Discussed ideas and issues with father.	