



**CALIFORNIA STATE SCIENCE FAIR  
2005 PROJECT SUMMARY**

<b>Name(s)</b> <b>Kristen N. Uyemura</b>	<b>Project Number</b> <b>S1224</b>
<b>Project Title</b> <b>Variegation and Repeated Sequences on the Rubik's Cube</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> An investigation was conducted on the Rubik's cube to determine if a relationship exists between the order of a move sequence (the number of times the sequence must be performed on a solved cube for the cube to return to its original state) and the cube's average variegation (degree of disorder).</p> <p><b>Methods/Materials</b> A computer program was written in QBASIC to simulate a Rubik's cube and compute average variegation. Using this program, data was collected, revealing the average variegation of a cube as various sequences were repeated on it.</p> <p><b>Results</b> In sequences with orders small enough to be analyzed, it was discovered that when variegation was graphed against the number of repetitions of the sequence, the resulting points fit a 4th degree polynomial equation.</p> <p><b>Conclusions/Discussion</b> Based on this and the appearance of the graphs of the remaining sequences, it is suggested that variegation during repetition of any given sequence may always change according to a polynomial expression of varying degree. The results also suggest that the larger the order of the sequence, the higher the degree of the polynomial, although further investigation must be carried out before this can be proven.</p>	
<b>Summary Statement</b> This project explores the mathematics of how the average variegation of a Rubik's cube changes as sequences of moves are repeated on it.	
<b>Help Received</b> Fellow student helped debug QBASIC computer program.	