



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) James G. Karroum, II	Project Number 33582
Project Title Mechanical Advantage and Efficiency of Pulley Systems	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my science fair project was to find out how changing the number and configuration of sheaves (pulley wheels) in a pulley system affects mechanical advantage and efficiency of the pulley system. My hypothesis stated that if correct, mechanical advantage will not increase with the number of sheaves in fixed systems, but will in block and tackle systems, and mechanical efficiency will decrease for both systems.</p> <p>Methods/Materials I built two frames to hang pulleys from # one for fixed systems, the other for block and tackle systems. My fixed systems have one, three, and five sheaves; my block and tackle systems have one, two, three, and four sheaves. To test my hypothesis, I threaded rope through the sheave(s), attached a weight to the load side of the rope and another to the fall side, recorded the amount of weight needed to lift the load, and repeated it for all systems.</p> <p>Results My data showed that in fixed systems there is no benefit to using more than one sheave because it progressively increases the fall weight to lift the load. Block and tackle systems have a benefit (even with friction) because they increase mechanical advantage, meaning that a smaller fall weight is needed to lift the load.</p> <p>Conclusions/Discussion My conclusion is that when the number of sheaves increases, mechanical advantage does not increase in fixed systems, but does in block and tackle systems. Mechanical efficiency decreases in both systems when the number of sheaves increases. My hypothesis has been proven correct.</p>	
Summary Statement How the number & configuration of sheaves in a pulley system affects mechanical advantage & efficiency.	
Help Received Dad helped me build the apparatuses. Mom helped me gather the materials and proofread my report.	