



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) David M. Lee	Project Number S0212
Project Title Trebuchet	
Objectives/Goals -Can trial and error testing of different projectile weights, counterweights and throwing arm lengths establish simple relationships that can determine throwing distance? -Can modern physics and mathematics accurately predict throwing distances?	
Abstract Methods/Materials douglas fir drill rod collets masonite screws plywood wheels eye hooks particle board nuts scales golf balls pennies weights measuring tape chain bolts washers Construct trebuchet Test : Launch 15 golf balls at the different settings of variables. Use rolls of pennies as your counterweightRecord the distance each ball was launched.	
Results The trebuchet launched the golf ball the furthest distance when it was free rolling, had a release angle at 60 degrees, had the longest setting of the throwing arm, had a counter weight that fell at the greatest distance, did not have a restricted throwing arm, and had the greatest amount of weight in the counterweight basket.	
Conclusions/Discussion My conclusions are that the golf ball was thrown the furthest at the settings stated above due to the following reasons; In theory a release angle of 45 degrees should allow the projectile to be thrown the furthest, however when the angle was set at 45 degrees the golf ball slipped out of the basket it was held in. Any angle less than 60 degrees caused the arc of the golf ball to be too flat and any angle greater than 60 degrees caused the ball to slip. The longer arm setting allowed for the maximum size of the arc of the golf ball. The greater distance traveled by the fallen counterweight allowed it to gain my speed through the constant acceleration. Thus, creating a greater force and launching the ball further. The greater amount of weight in the counterweight basket allowed more force to be had. When the trebuchet was allowed to be free rolling the counterweight fell in a straighter path perpendicular to the ground. When the cocked arm is released the counterweight comes down in a circular path causing the constant acceleration due to gravity to be not completely pure. If a trebuchet with wheels is fired, it will rock forward allowing the weight to fall in a straighter path.	
Summary Statement My project is about experimeting with a model trebuchet to find if modern mathematics and physics can predict throwing distances.	
Help Received Father helped with the potentially dangerous parts of making the trebuchet; Two Uncles helped with the calculations; Sister and Mother helped with collecting the data	