



# CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

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<b>Project Title</b> <b>Math in Ballistics</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The object of my experiment is to gather acceleration, and ballistic data by using a car and track so that I may derive a probabilistic curve. This data helps scientists, engineers, and military accomplish their respective goals. <b>Methods/Materials</b> I nailed support beams, in which the height and distance from the center of the beam follow a parabolic curve, into a wooden 2 by 4. Next, I nailed quarter-inch PVC to the origin of the parabolic shaped support beams, so that the PVC only touched the base of the wood at the origin. Then, I attached the Hot Wheels track on top of the PVC. Following this I placed a wooden beam with paper target board, at the opposite side of the 2 by 4. The width of the car used is 30 mm, the height 15 mm, the frontal area of the car needed to calculate the air drag is 0.00045 m <sup>2</sup> and the mass 31.5 g. <b>Results</b> 1. The higher the release height of the car on the parabolic track, the farther the car will jump horizontally from the ramp. 2. Friction Force and drag force will reduce the horizontal jump distance when compared to the maximum ideal jump distance. 3. A constant friction coefficient and drag coefficient exist that describe jump distance and car motion on high speed videos. 4. The car landing locations form an elliptical region, with this elliptical region containing almost all landing locations. Using this data, and the right formula, I can derive a basic, or more accurately, general probabilistic curve. <b>Conclusions/Discussion</b> The results support my hypothesis. The data from this project is essential to rocket launches, airplane takeoffs, space craft orbiting and docking and military projectiles (missiles, howitzers). It will help in the design and construction of everything from skis for ski jumping to bullets for rifles or even applications for Mars landings.	
<b>Summary Statement</b> I used a ramp and a hot wheel car to illustrate the ballistic probabilistic curve, and this probabilistic curve helps you determine in a variety of situations how many of the propelled objects to launch at the target and where to aim them.	
<b>Help Received</b> My mother helped me purchase the materials. A friend used the high speed camera. I thank my teacher for his guidance.	