

Mathematical Modeling of Motion

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In this curriculum unit, students will use apparatus (including adjustable ball launchers and/or catapults) and videos (pre-made and student-made), to collect data related to projectile motion. They will vary the parameters of initial height, initial velocity and angle of elevation to find their effects on the mathematical models (connecting trigonometry and quadratic functions). Students will use available electronic measuring device(s) and computer software, including simulations to collect their data. They will use graphing calculators or other computer software to analyze their data and to write functions that can be used to predict further data points in both the vertical and horizontal directions. The ultimate goal is for students to create a mathematical model they can use to set up the ideal position and conditions for launching a ball to hit a bulls-eye target. This unit is written for physics students to quantify one- and two-dimensional motion through scientific Inquiry. They will form questions that generate testable hypotheses, and design experiments to test their hypotheses. Throughout the unit, students will use a Mathematical Modeling Cycle to generate appropriate linear and quadratic models. This unit could also be adapted for high school math students studying quadratic functions and/or vectors.