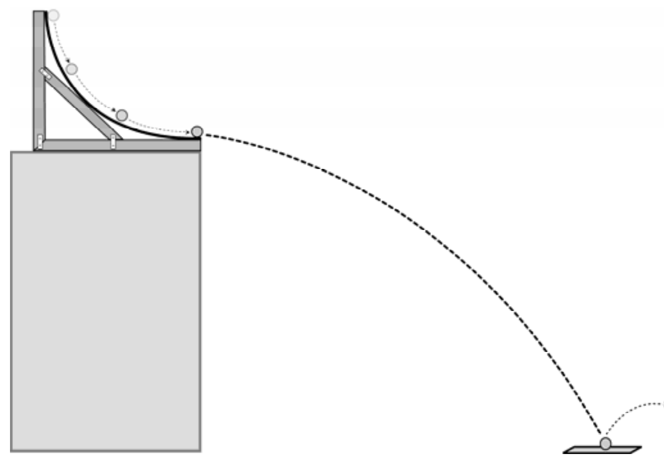
Flying Off the Handle

In Hollywood movies, a classic way to end a car chase is to have a car drive off a cliff or into a canyon, with the hero jumping out of the car at the last minute to safety. Movie directors need to know exactly where the car will land so that they can have cameras in place to capture the motion on film. They also need to know where the car will be as it falls from the edge of the cliff to the floor of the canyon below so that they can have cameras in place there, too. How can we model this motion? How can we harness technology to apply this model to pinpoint the specific location of a moving object at any time?

To answer these questions, let's build a model that will enable us to simulate a car driving off a cliff. Use a wooden ramp and marble to simulate the car's motion. How would we develop a function rule to determine the placement of the cup on top of a stack of textbooks?

Set up the ramp on a high table. Roll the marble down the ramp and let it hit the floor to observe the motion of the marble.



1. Let the floor represent the x-axis and the end of the ramp be contained on the y-axis. Where would the origin of this coordinate system be?

2. In this coordinate system, what do x and y represent?

3. Consider the path of the marble. Based on your coordinate system, what does the *y*-intercept represent? What are the coordinates of the *y*-intercept? Record the coordinates as a point in the table.

Horizontal Distance (*x*)	Height of the Marble (*y*)

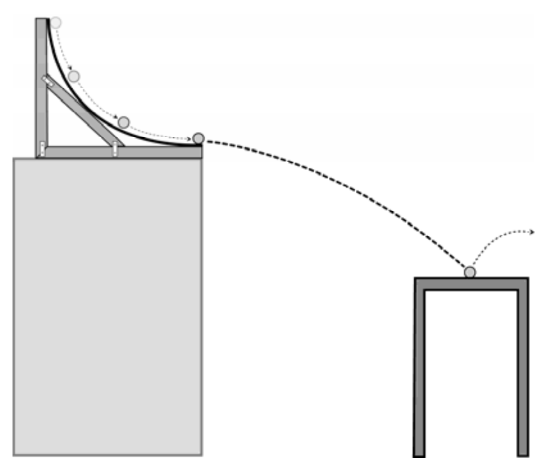
4. Based on your coordinate system, what does the *x*-intercept represent?

Roll the marble down the ramp and notice where it strikes the floor. Tape a piece of carbon paper on top of a piece of typing paper (carbon side down) where the marble touched the floor. Tape the paper to the floor.

Roll the marble down the ramp and let it strike the paper on the floor. Repeat at least twice so that you have data for at least 3 trials.

5. What are the coordinates of the *x*-intercept? Record the coordinates as a point in the table.

6. Place a chair or desk between the ramp and the point of impact on the floor. Repeat your data collection procedure to find the *x*- and *y*-coordinates of the point of impact on the chair or desk. Record your third data point in the table.



7. What kind of functional relationship do you think exists between the horizontal distance and the vertical distance of the marble?

8. Make a scatterplot of your data. Sketch your plot.

9. Use the coordinates of the three data points to write a function rule that could be used to predict the height of the marble, y, when it is a horizontal distance, x, from the ramp. Explain how you found your function.

10. Graph your function rule over your scatterplot and sketch your graph. Is the function rule a good fit? How can you tell? If not, how can you revise your function rule so that it is a better fit?

11. Place your cup on top of three textbooks. Where do you need to place the cup so that the marble will roll off the ramp and land inside the cup? Justify your choice.

12. Test your prediction. Was your prediction correct? Why or why not? If not, revise your prediction and test it again.

Flying Off the Handle: Intentional Use of Data

TEKS		
TEKS		
Question(s) to Pose to Students — Math		
Question(s) to Pose to Students — Tech		
Cognitive Rigor	Knowledge	
	Understanding	
	Application	
	Analysis	
	Evaluation	
	Creation	
Data Source(s)	Real-Time	
	Archival	
	Categorical	
	Numerical	
Setting	Computer Lab	
	Mini-Lab	
	One Computer	
	Graphing Calculator	
	Measurement-Based Data Collection	
Bridge to the Classroom		