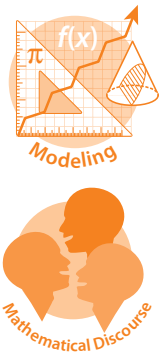
Name: **Date:**

Conceptual Task: Free Fall



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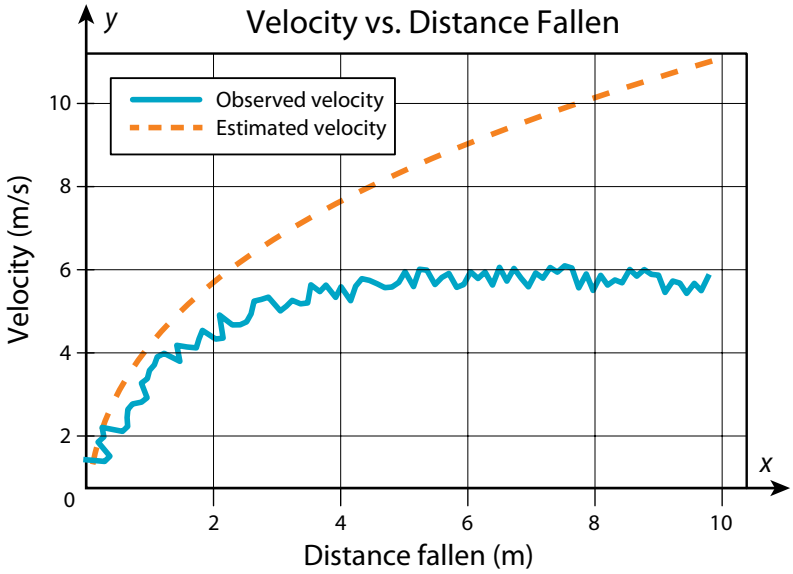
7 ✓	8

Students in a physics class are learning about gravity. One group of students is investigating the relationship between the distance an object has fallen and its velocity. They are given the following equation relating the velocity, v, acceleration due to gravity, g, and vertical displacement, x, of an object falling under the force of gravity with no air resistance:

$$\frac{v^2}{2g} = x$$

On Earth, $g = 9.8\frac{m}{s^2}$.

The students conduct an experiment in which they drop a tennis ball from 10 meters high and measure its velocity throughout its descent. The data from the experiment is shown in the graph below along with the estimated velocity using the equation $\frac{v^2}{2g} = x$.



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Exploration Questions

a. What is the relationship being explored?

b. What are the different variables and what do they represent?

c. What are the two lines on the graph? What does each one represent?

d. What observations can you make of the two lines?

e. What might be the cause of the differences in the two lines?

f. Using the given equation, how is v related to x? What kind of expression is this?

g. How could the equation be used to calculate the distance an object must fall, x, before reaching a certain velocity, V?

h. How could the equation be adapted to find the velocity of an object that has fallen x meters on a planet where gravity causes an acceleration of $14.5 \frac{m}{s^2}$? What part(s) of the equation would need to change?