Bouncing Ball

Part I

How high will a ball bounce after it has been dropped from a certain height?

1. Kainoa and Keala were playing with a ball. They noticed that when they dropped the ball from a height of 6 feet, on its first bounce it rose to a height of 4 feet. Kainoa said, "I bet if we drop it from 8 feet, on the first bounce it will rise to 6 feet." Keala was not sure if she agreed with Kainoa's conjecture. Do you agree with Kainoa? Explain your reasoning.
2. Keala suggested an experiment to see what happens when a ball is dropped from different heights and how high it bounces after the first bounce. She suggested they measure in centimeters because it was easier for her to read the measurements.

a. Place a centimeter tape or meter stick from the floor up against a wall designated for your group.
b. Drop the ball from the 20 cm mark. Make sure that another member in your group is ready to watch. Observe and record the height of the ball after its first bounce.

   Drop the ball one or two more times from the 20 cm mark. After each drop, observe and record the height after its first bounce. You should have two or three heights recorded in a table like the one below.

   Repeat this procedure for drops from 40 cm, 60 cm, 80 cm, and 100 cm.

Height of drop	1st try	2nd try	3rd try	Representative bounce height
20 cm				
40 cm				
60 cm				
80 cm				
100 cm				

c. Choose a representative height after one bounce for each of the drop heights of 20 cm, 40 cm, 60 cm, 80 cm, and 100 cm in the last column. Explain your method for deciding a representative height.
d. Make a graph of the data from the table.
e. Draw a line that you think best represents your data. Describe how you decided on your line.
f. Determine an equation for your line. Describe how you found the equation.

Part II

1. Analyze how well the graph of the equation models the bounce heights from your data collection. Circle the points that do not lie on the line.
   a. For each point you circled, draw a vertical line from your circled point to the line generated by the equation.
   b. Use two colors of paper strips to represent the lengths of the vertical lines that you drew in Problem 1.a. One color will represent distances below the line and the other color to represent distances above the line. Collect the strips and find the total lengths for each strip color. How do the lengths compare?
2. How can your findings from Part II Problem 1 help you assess how well your equation models your data set?
3. Use your equation from Part I Problem 2.f to answer the questions below.
   a. How high would the ball bounce on its first bounce if it were dropped from a height of 50 cm? 75 cm? How did you decide on the height of each first bounce?

Do you agree with Kainoa's conjecture from Part I Problem 1? Why or why not?