**Using Recursion in Models and Decision Making: Recursion in Exponential**

**Growth and Decay**

IV.B Student Activity Sheet 3: Recursion and Exponential Functions

Different balls bounce at various heights depending on things like the type of ball, the

pressure of air in the ball, and the surface on which it is bounced. The rebound percentage

of a ball is found by determining the quotient of the rebound height (that is the height of

each bounce) to the height of the ball before that bounce, converted to a percentage.

**1.** Collect data on a bouncing ball that show the maximum height of at least five bounces of

the ball. Then make a scatterplot of the maximum height as a function of the bounce

number. (Let Bounce 0 be the initial drop height of the ball.)

**2.** Find the average rebound percentage for your ball. Show your work.

**3.** Tennis balls are sealed in a pressurized container to maintain the rebound percentage

of the balls. A tennis ball has a rebound percentage of 55% when it is taken out of the

pressurized can. Suppose a tennis ball is dropped from a height of 2 meters onto a tennis

court. Use the rebound rate given to predict the height of the ball’s first seven bounces.

**4.** Write a recursive rule for the height of the ball for each successive bounce.

**5.** Describe, in words, how the height of each bounce is calculated from the height of the

previous bounce.

**6.** Enter the bounce height data into a graphing calculator. Make a scatterplot and then

sketch the graph below.

**7.** What kind of function might model the tennis ball bounce situation? Explain your

reasoning with a table of values or other representation.

**8.** Look back at the table you generated in Question 3. Write a function rule for bounce

height in terms of bounce number. Graph the function rule with the scatterplot on your

graphing calculator to see if the function rule models the data.

**9.** What is the height of the fifth bounce of a new tennis ball if the initial drop height is

10 meters above the ground? Use a function rule to find your answer.

**10.** Suppose a new tennis ball is dropped from a height of 20 feet. How many times does it

bounce before it has a bounce height of less than 4 inches (the diameter of the ball)?

Explain your solution.

**11.** What is the total vertical distance that the ball from Question 10 has traveled after six

bounces? Explain your answer.

**12. REFLECTION:** How can you decide if a data set can be modeled by an exponential

function? How are recursive rules different from function rules for modeling

exponential data? How are they the same?

