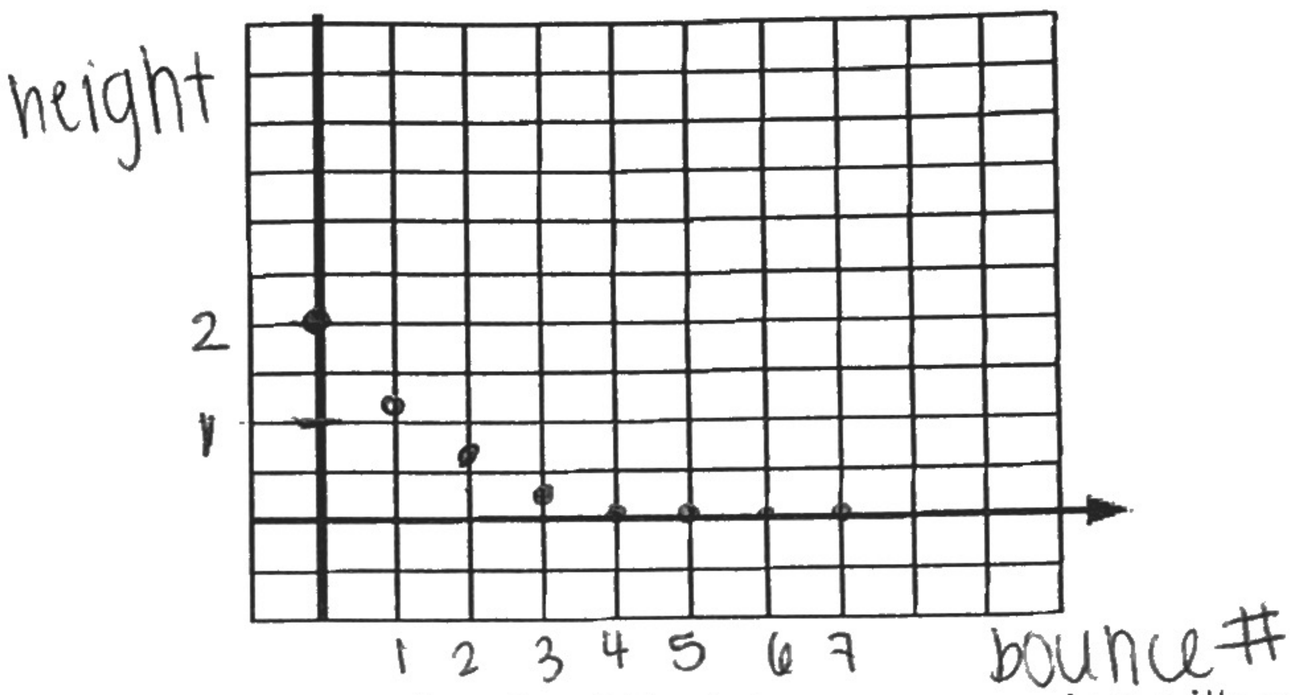
AMDM
SAS 3 Day 2

Name: KEY

5. Enter the following tennis ball bounce height data into a graphing calculator. Make a scatterplot and then sketch the graph below.

Bounce No.	Height
0	2
1	1.1
2	0.605
3	0.333
4	0.183
5	0.101
6	0.056
7	0.031



7. What kind of function might model the tennis ball bounce situation? Explain your reasoning with a table of values or other representation.

Bounce No.	Height (m)	First Differences (subtract)	Successive Ratios (divide)
0	2		
1	1.1	$1.1 - 2 = -0.9$	$\frac{1.1}{2} = 0.55$
2	0.605	$0.605 - 1.1 = -0.495$	$\frac{0.605}{1.1} = 0.55$
3	0.333	$0.333 - 0.605 = -0.272$	$\frac{0.333}{0.605} = 0.55$
4	0.183	$0.183 - 0.333 = -0.15$	$\frac{0.183}{0.333} = 0.55$
5	0.101	$0.101 - 0.183 = -0.082$	$0.101/0.183 = 0.55$
6	0.056	$0.056 - 0.101 = -0.045$	$\frac{0.056}{0.101} = 0.55$
7	0.031	$0.031 - 0.056 = -0.025$	$\frac{0.031}{0.056} = 0.55$

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. $a_n = 2(0.55)^n$ → multiplies by 0.55 each time

or $a_n = 1.1(0.55)^{n-1}$

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.

$a_n = 10(0.55)^n$

$a_5 = 10(0.55)^5 = 0.503$ meters above the ground

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.

$a_n = 20(0.55)^n$ (in ft)

12(20) = 240

or (in inches)

$a_n = 240(0.55)^n$

or 4in = 0.333ft

Bounce	Height (ft)	Height (in)
1	$a_1 = 20(0.55)^1 = 11$	12(11) = 132
2	6.05	72.6
3	3.33	39.93
4	1.83	21.96
5	1.01	12.08
6	0.55	6.64
7	0.304	3.65
8	0.167	2.01
9	0.09	1.105

After the 6th bounce, the bounce height is less than 4inches

11. What is the total vertical distance that the ball from Question 10 has traveled after six bounces? Explain your answer.

the total vertical distance = total distance fallen + total dist. risen

fallen: 20 + 11 + 6.05 + 3.33 + 1.83 + 1.01 = 43.22

risen: 11 + 6.05 + 3.33 + 1.83 + 1.01 + 0.55 = 23.77

total = 43.22 + 23.77

total = 66.99

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?

- exponential if there is a common ratio. (multiply to get from one term to the next)
- recursive rule → need to know the previous term to find the next term.
- function rule = explicit rule → you can input any term to get a specific output
- both have a common ratio and a_0 (start value)

recursive ① $a_0 =$ __ , ② $a_n = r(a_{n-1})$

explicit ③ $a_n = a_0(r)^n$