



That's the Way the Ball Bounces!

Day 1

1-Learning Goals for Students:

- to collect data that can be modelled (graph) by an exponential relation
- to collect primary data through an experiment
- to solve a real-world application by graphing data using technology

2-What will I be doing?

- You will be estimating the “bounce return” height after several numbers of bounces of a ball, recording the data, then using the data to create a graph.
- The data will be modeled (represented) by an exponential decay curve (drawn with technology).
- With a curve of best fit, you’ll then be able interpolate (“read within the data”) and/or extrapolate (“read beyond the data”) values to solve problems about bounce return height using your knowledge of exponential decay.

3-Materials

Meter stick(s)

Balls (Two of: golf, tennis, basketball, or other provided)

Computer (with *Fathom* software; for Day 2)

4-Set up

- Maximum of 3 students per group
- Roles: drop, catch, measure, record
- Two charts—one for each type of ball used
 - Use any two of golf, tennis, basketball, or other (as provided)
 - Charts are provided (see below)

5-Procedure

a) Work with one type of ball for the full experiment, record your data, and then repeat the procedure for the second type of ball. Note: The ball must be dropped from the same height every time.

b) Measure the drop height in cm (200 cm for Experiment 1; your choice for Experiment 2). Record your results in the table provided.

c) Drop the ball. One group member should catch the ball at its highest point after one bounce and hold it still. Another member measures the height. Record the data in the table. Note: Make sure that you’re measuring the rebound height from the same ‘position’ of the ball—i.e., clarify if it’s going to be the top or bottom of the ball and why.

d) Drop the ball from the same height and let it bounce twice before you catch and measure. Repeat for 3, 4, 5,...bounces, accordingly.

6-Data Tables



First Experiment: Type of Ball _____

Number of bounces	0	1	2	3	4	5			
Height, cm	200								

Second Experiment: Type of Ball _____

Number of bounces	0	1	2	3	4	5			
Height, cm									

7-Follow-up Questions

Using your data, complete the following questions for both experiments.

Experiment 1	Experiment 2
Determine the decay factor (i.e., the ratio between consecutive rebound heights). Show a calculation.	Determine the decay factor (i.e., the ratio between consecutive rebound heights). Show a calculation.
Determine the decay rate (i.e., this is the percent decrease in rebound heights; also $(1 - \text{decay factor})$).	Determine the decay rate (i.e., this is the percent decrease in rebound heights; also $(1 - \text{decay factor})$).
What would you predict the height to be after 10 bounces? Show a calculation.	What would you predict the height to be after 10 bounces? Show a calculation.

8-Next Few Classes: Looking Ahead

Learning Goal 2 (Day 2): To understand the properties of exponential relations—namely, the significance of the parameters of the exponential equation, $y = Ab^x$ —and to apply this equation to solving problems (worked examples).

Learning Goal 3 (Day 3): To import data (today’s data set) into the statistical software, *Fathom*, and use the software to determine the equation for the curve (exponential) of best fit. Based on the equation, you will validate your estimated answers from Day 1 (see “Follow-up Questions” section).

Check

Learning Goal 4 (Day 4): Compare group results to see if they concur in their results and discuss why results are similar or different. What qualities about a ball makes it more bouncy?