Name _____ Date _____ Group # _____

How High Will It Bounce?

Many games depend on how a ball bounces. For example, if all basketballs did not rebound the same a player would be unable to anticipate how their shot would bounce off the backboard which may cause them to miss their shot. There are actually industry standards for ball bounciness!

What kind of ball do you think is the "Bounciest"? Rank the following balls in order from least to greatest bounciness.

Lacrosse ball, Tennis ball, Basketball, Ping Pong Ball, Golf Ball, or Playground Ball

least ——————————→ *greatest*

Ball your group is assigned: _____

Team Jobs:

Dropper - _____

Videographer - _____

Spotter/Recorder(s) - _____

Determining rebound heights:

You are going to determine the rebound height for the ball you have been assigned. To do this you will be dropping the ball from various heights and recording the maximum height it attains after bouncing once on the floor. To help determine the rebound height, you may want to video the rebound of the ball.

Guidelines:

- Pick five different drop heights you wish to test. The intervals between the heights should ***not*** be evenly spaced.
- Measure 3 times at each height.
- If taking video of each rebound, make sure the iPad is perpendicular to the floor and parallel to the wall that the measuring tape is on.
- Ball height measurements will be made from the _____ of the ball.
  top/bottom

Rebound Height Data

Initial Height (cm)	**Rebound Height (cm)** 3 measurements	**Average Rebound Height (cm)**

1. Does the Initial Height depend on the Rebound Height, or is it the other way around? Which is the independent variable, and which is the dependent variable?

2. Using Desmos:

    a. plot your points

    b. Have Desmos calculate a line of best fit: ($y_1 \sim mx_1 + b$)

    c. What is the equation for your line?

3. Should the line of best fit go through the origin or not? Justify your answer in the context of the problem.

4. Should your data points be connected in the graph? Justify your answer.

5. What is the rebound ratio (Rebound Height/Initial Height) for your ball? How is the rebound ratio reflected in the **graph** of your line of best fit? Where is it reflected in the **equation** for your data?

6. Does the height from which you drop the ball affect the rebound ratio?

7. What would be the rebound height if you dropped your ball from a height of 10 meters? Show how you made your estimate.

What if you drop the ball from a height of 250 cm and let it bounce repeatedly?

8. Fill in the middle column of the table below with **predicted** heights (based on information from above) for your ball after each of 6 successive bounces. (Drop the ball and let it bounce 6 times.)

Bounce Number	Predicted Height (cm)	Actual Height from experimental data (cm)
0 (before drop)	250	250
1		
2		
3		
4		
5		
6		

9. Test your predictions by collecting experimental data. Fill in the table on the previous page.

   *Make sure your videographer is far enough away from the ball drop to capture all the rebounds with the iPad perpendicular to the floor and parallel to the measuring tape. *

10. How does your data compare to your predictions? Why might there be differences?

11. Using Desmos, graph your data.

12. Could a linear relationship model the height of successive bounces? Explain.

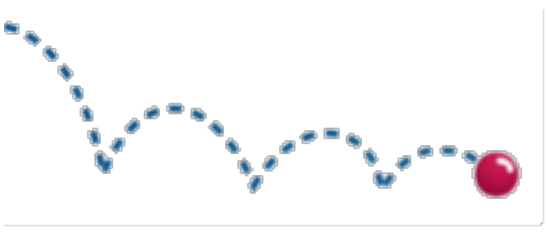
13. Could an exponential relationship model the height of successive bounces? If so,

    a. Can you write an equation?

    b. What do the values of *a* and *b* represent in the context of the problem?

14. Should the data points for this graph be connected?

15. What are the rebound ratios for all the balls used? Were your predictions correct as to the "bounciness" of the different balls?



Ball	Rebound Ratio	Bounciness Rank
Lacrosse ball		
Tennis ball		
Basketball		
Ping Pong Ball		
Golf Ball		
Playground Ball		