

Name _____ Date _____

The Bouncing Ball

Picture

**Draw a picture of the experimental setup.
Call the drop height D and the bounce height B .
Label D and B in your drawing.**

1. Which is the manipulated variable in each experiment?

Experiment 1: _____

Experiment 2: _____

2. Which is the responding variable in each experiment?

Experiment 1: _____

Experiment 2: _____

3. What variables should be held fixed during each experiment?

Experiment 1: _____

Experiment 2: _____

4. What variable changes from Experiment 1 to Experiment 2?

Data Tables

Experiment 1

Work with your group.
Use a tennis ball.
Put your data in Table I.

Table I: Type of Ball _____

D Drop Height in _____ units	B Bounce Height in _____ units			
	Trial 1	Trial 2	Trial 3	Average
40				
80				
120				

Experiment 2

Work with your group.
Use a super ball.
Put your data in Table II.

Table II: Type of Ball _____

D Drop Height in _____ units	B Bounce Height in _____ units			
	Trial 1	Trial 2	Trial 3	Average
40				
80				
120				

5. Why is it a good idea to carry out three trials for each value of D?

6. Why did you take an eyeball average value for B?

Graph

Plot the data from both experiments on one sheet of graph paper. Choose your scale carefully. Be sure to leave enough room for extrapolation. Fit a “curve” to each set of the data points. Label each curve.

7. On which axis (horizontal or vertical) did you plot the manipulated variable?

8. On which axis (horizontal or vertical) did you plot the responding variable?

9. Should (0,0) be included as a data point? _____

Why or why not? _____

10. Should the curve pass through data point (0,0)? _____

Why or why not? _____

11. Is the curve a straight line? _____

Comprehension Questions

12. Is D a quantitative or a qualitative variable?

13. Is the type of ball a quantitative or a qualitative variable?

Use your graph to answer problems 14 through 17:

14a. The drop height of the tennis ball is 60 cm.
Predict the bounce height.

D = 60 cm, Predicted B = _____

14b. Did you use interpolation or extrapolation to find your answer?

14c. Check your prediction experimentally.
What is the actual bounce height?

D = 60 cm, Actual B = _____

15a. The drop height of the tennis ball is 160 cm.
Predict what the bounce height would be.

D = 160 cm, Predicted B = _____

15b. Did you use interpolation or extrapolation to find your answer?

15c. Check your prediction experimentally.
What is the actual bounce height?

D = 160 cm, Actual B = _____

16a. The tennis ball bounces back to a height of 55 cm.
From what height was it dropped?

B = 55 cm, Predicted D = _____

16b. Did you use interpolation or extrapolation to find your answer?

16c. Check your prediction experimentally.
Was your bounce height close to 55 cm? _____

17. Look at your graph.
What pattern do you see?

18. Why did you redo the experiment with a different ball?

19a. The drop height of the super ball is 1 meter.
What would the bounce height be?

D = 1 m, Predicted B = _____

19b. Did you interpolate or extrapolate to find your answer?

20a. If the super ball rebounds to a height of 2 meters, from what height was it dropped?

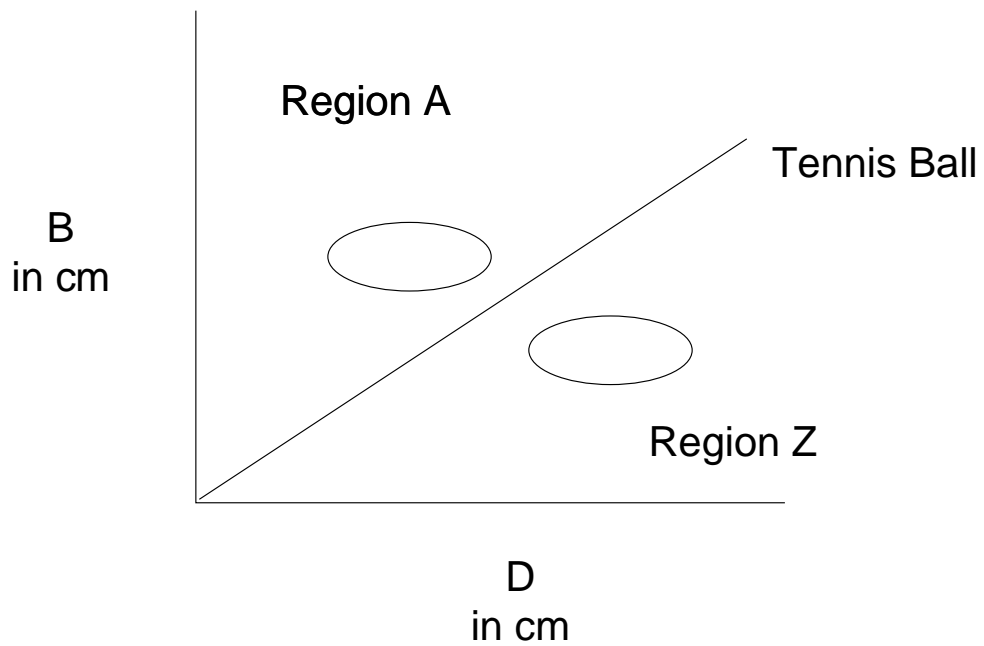
20b. How did you find your answer? _____

21. You find a strange ball on the playground. Because you have been investigating bouncing balls, you drop the ball from a height of 50 cm. It bounces back to a height of 18 cm. Is it more like the tennis ball or the super ball?

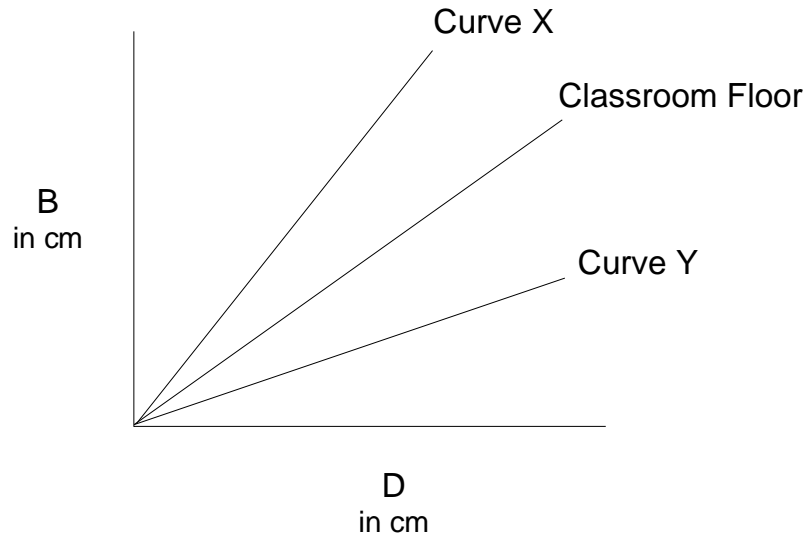
Why do you think so? _____

22. Olga brings in a ball which is not as lively as a tennis ball. Would you expect the curve for Olga's ball to lie in Region A or Region Z on the graph below?

Explain your choice. _____

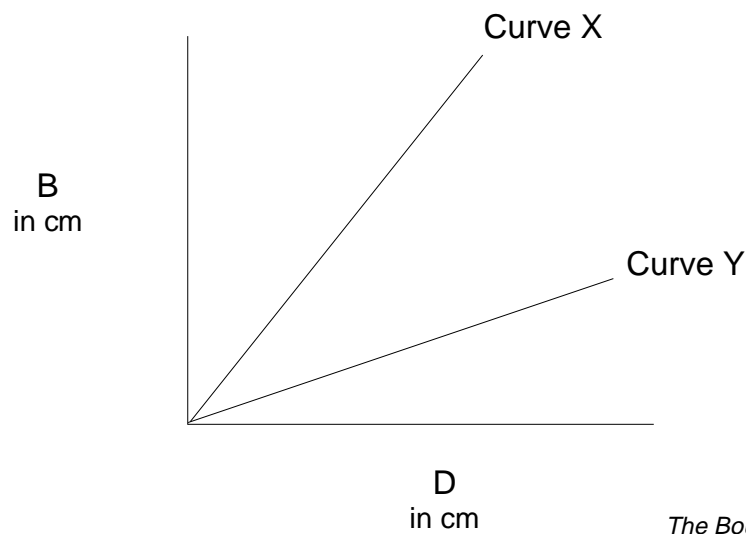


23. If you did your experiment with the tennis ball on a soft rug instead of on your classroom floor, would the curve you obtained be more like Curve X or Curve Y?



24. Balls are supposed to bounce higher on clay tennis courts than grass courts. Does Curve X or Curve Y in the graph below show data taken on a clay court?

Explain your choice. _____



25. Fill in this table for an experiment using a rubber ball.

Table III

D in cm	B in cm
40	30
	60
100	

26. Plot the data you obtained from problem 25 on another sheet of graph paper. Fit a curve to the data points.

From the curve, find the ratio $\frac{B}{D}$ for:

$$D = 20 \text{ cm}, \frac{B}{D} = \underline{\hspace{2cm}}$$

$$D = 40 \text{ cm}, \frac{B}{D} = \underline{\hspace{2cm}}$$

$$D = 80 \text{ cm}, \frac{B}{D} = \underline{\hspace{2cm}}$$

- 26a. Are the ratios close to each other? Use your calculator to check.

26b. Using a ratio, find D when B is 90 cm. _____

27. A ball is dropped from a height of 30 cm. It bounces to a height of 10 cm.

27a. If the ball were dropped from a height of 60 cm, how high would it bounce?

27b. If the ball bounces to a height of 25 cm, from what height was it dropped?

28. Belinda wants to do a Bouncing Ball experiment. Choose the data table with the values of D that would make her experiment better.

Explain your choice. _____

Table IV

D in cm	B in cm
30	
35	
40	

Table V

D in cm	B in cm
20	
40	
80	