Height of Bounce
Task Information

Grade: 8th grade

Content: Physical Science G 1B1 Nature of Motion

Format: Manipulative

Purpose: Students will determine the relationship between the height of bounce of a ping-pong ball and the height from which it was dropped.

Skills:

Primary: Recording and Interpreting data
Secondary: Predicting

Time: 15 - 20 minutes

Materials:

Per student

- 1 ping-pong ball
- 1 box top fitted with a metric scale (0-45 cm)
- 3 books
- masking tape or duct tape

Preparation:

- The metric scale is attached to the outside of a large box top. A copy paper box works very well.
- Use adhesive metric tape or a tape measure for the scale
- The box top must be anchored to the workspace with books or tape before the students begin the task
- An acceptable range of answers for height of bounce needs to be established by the teacher before student testing. To establish ranges for the scoring rubric, testing should be done on the same surface and with the same equipment that the students will be using.
- See the scoring rubric for further clarification.

Safety:

- The ping pong balls will occasionally roll off of the work space. Instruct the students to retrieve them, but **not** to run or disturb others around them.
- Remind students **not** to throw ping-pong balls.

Extensions/Modifications:

- Instead of the box set up, a metric ruler may be taped to a vertical surface.

NYS Alternative Assessment in Science Project
NSF Grant #MDR-9154506

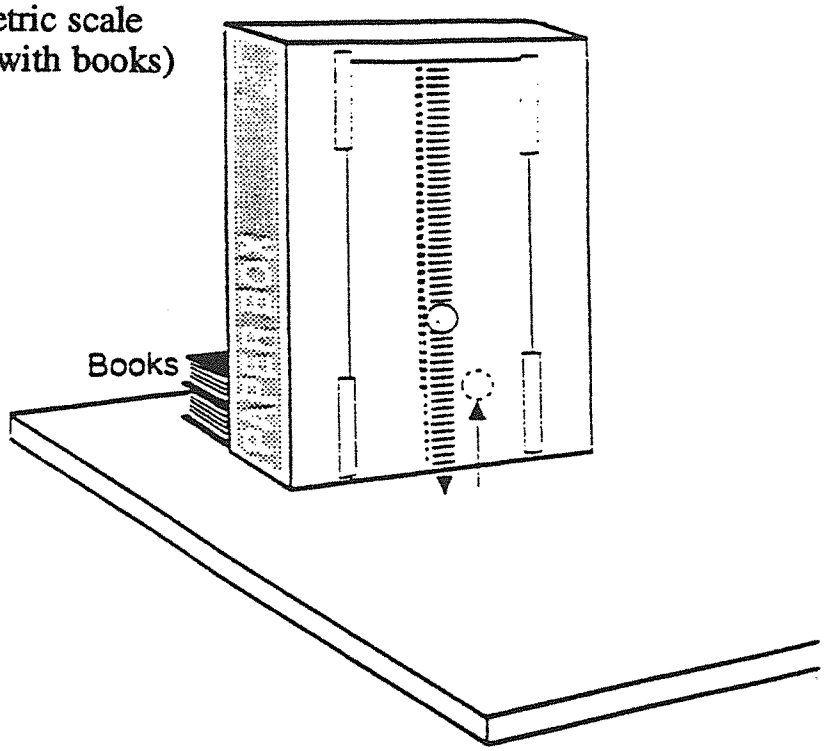
Copyright, April 1996
The State University of New York
The State Education Department
Albany, New York 12234

Height of Bounce

Task: At this station, you will be measuring the effect of height on the bounce of a ping pong ball.

Materials

- ping pong ball
- 1 box top fitted with a metric scale (taped down or balanced with books)
- calculator



Directions

1. Check to see that your materials are set up as shown in the diagram above.
2. Before you begin your task, follow the directions inside the box:

> For practice, release the ball from any point on the scale and determine the height to which it bounces. The "height of bounce" is the distance from the table top to the bottom of the ball on the first bounce. (Practice a few times to make an accurate observation.

3. **Your task:** Hold the ball near the scale on the box so that the bottom of the ball is level with the 10 centimeter mark. Release the ball and observe how high it bounces.
4. Record the height that the ball bounced in trial 1 on the data table. Round your answer to the nearest whole number of centimeters.
5. Repeat steps 3 and 4 for release heights of 20 cm, 30 cm, and 40 cm.

Please Continue on the Next Page

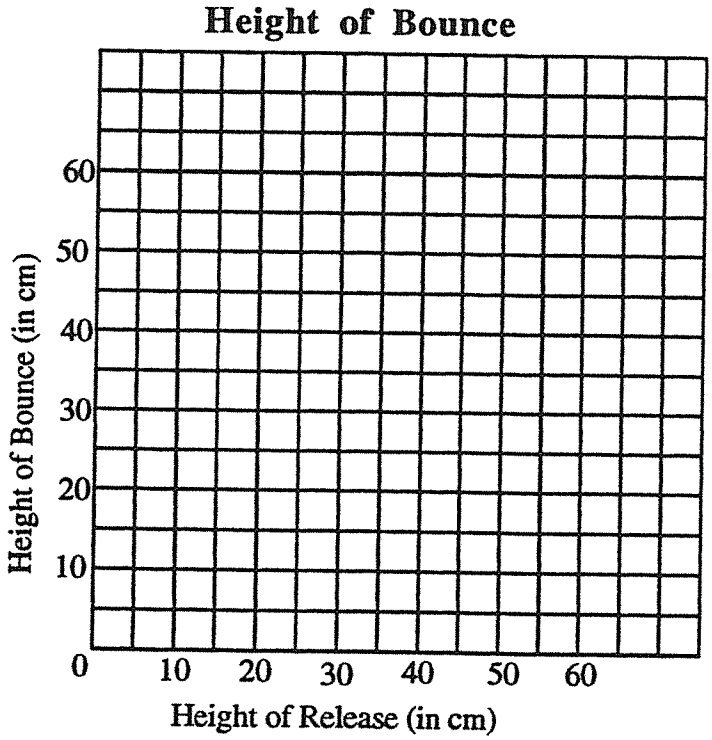
NYS Alternative Assessment in Science Project
NSF Grant #MDR-9154506

Copyright, April 1996
The State University of New York
The State Education Department
Albany, New York 12234

Data Table: Height of Bounce (in cm)

Height of Release	Trial 1	Trial 2	Trial 3	Average
10 cm				
20 cm				
30 cm				
40 cm				

6. Use the average data from your data table to construct a graph on the grid below. Connect the points to make a line graph.



Please Continue on the Next Page

NYS Alternative Assessment in Science Project
NSF Grant #MDR-9154506

Copyright, April 1996
The State University of New York
The State Education Department
Albany, New York 12234

7. Based on your observations, write a generalized statement describing the relationship between the height of release and the height of bounce of a ping-pong ball.

_____

_____

_____

8. If you were able to bounce this ball from a height of 60 cm, how high (in centimeters) would you predict that the ball would bounce?

_____

In the space below, explain how you used your data to make this prediction.

_____

_____

_____

_____

NYS Alternative Assessment in Science Project
NSF Grant #MDR-9154506

Copyright, April 1996
The State University of New York
The State Education Department
Albany, New York 12234

Height of Bounce - Scoring Rubric

Maximum score - 13 points

Questions 4. and 5. Height of bounce data table. **3 points total**

Height of Release	Height of Bounce (in centimeters)
10 cm	*3 - 6 cm*
20 cm	*10 - 18 cm*
30 cm	*15 -25 cm*
40 cm	*20 - 30 cm*

*** The ranges for height of bounce in the table are examples only.

Point Criteria:

- Allow 1 point for correctly averaging and rounding at least 3 of the 4 distances.
- Allow 1 point for data collection taken three times (3 trials).
- Allow 1 point for data showing height of bounce within the acceptable range in at least 3 of 4 releases.

*** The ranges in the table above are examples. Teachers should determine their own acceptable range for height of bounce before students do their testing.
To establish ranges, testing should be done on the same surface and with the same equipment that the students will be using.

Question 6. Graph of data. **5 points total**

Point Criteria:

- Allow 1 point for each data point plotted to an accuracy of +/- 0 cm "height of release," and +/- 2 cm "height of bounce" based on student's data.
- Allow 1 point for plotted points connected properly

Question 7. Relationship between bounce and release heights. **2 points total**

Point Criteria:

- Allow two points if the student states a directly proportional relationship between the height of bounce and the height of release.
  Possible answers:
  - As the height of release increases, the height of bounce increases.
  - The higher I release the ball, the higher the height of bounce.
  - The lower the height of release, the lower the height of bounce.
  - The height of bounce is approximately $^1/_2$ to $^3/_4$ that of the height of release.
  - The height of the release was higher than the height of bounce.
  - The height of the release is larger than the bounce.
  - The higher you drop the ball the further away the bounce was from the height you dropped it from.
- Allow one point (partial credit) if the student states the relationship only in terms of his/her own data.
  Possible answers:
  - A ball dropped from 40 cm bounces higher than a ball dropped from 10 cm.
  - A ball dropped from 40 cm bounces up to 30 cm high (or student's own data)

NYS Alternative Assessment in Science Project
NSF Grant #MDR-9154506

Copyright, April 1996
The State University of New York
The State Education Department
Albany, New York 12234

Question 8. Predict the bounce height for release of 60 cm **3 points total**

Point Criteria:

- Allow 1 point if the student successfully predicts a bounce height between 30 - 45 cm**
  ** This range is an example. The teacher should establish an acceptable range for this height of bounce also.
  - Accept a student's prediction if supported by his/her graph.
- Allow 2 points if the student explains his/her prediction using the data collected.
  - I extended the line on my graph and observed where it crossed over the 60 cm release point.
  - Since the heights of bounce were approximately $1/2$ to $3/4$ the height of release, a ball dropped from 60 cm would bounce 30 - 40 cm.
- Allow 1 point if the student implies or states that he/she tested a ball drop from 60 cm.

Highest possible score - 13 points

NYS Alternative Assessment in Science Project
NSF Grant #MDR-9154506

Copyright, April 1996
The State University of New York
The State Education Department
Albany, New York 12234

Student ID _____ **Scoring Form - Height of Bounce**

Male or Female (circle one

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Question	Circle Point Breakdown	Points Earned
4. & 5 Bounce Data Table		
3 trials completed	0 1	
Average	0 1	_____
Data within range	0 1	
6. Graph		
10 cm plot	0 1	
20 cm plot	0 1	
30 cm plot	0 1	
40 cm plot	0 1	_____
overall (connected) plot	0 1	
7 Stated Relationship	0 1 2	_____
8. Extrapolation to 60 cm		
Predicted height	0 1	
Explanation	0 1 2	_____

Total Score _____

Total possible score - 13 points

Student ID GMS27 Male or Female (circle one)

Height of Bounce

Scoring Form (Maximum Score = 14 points)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Question	Circle Point Breakdown	Points Earned
4. and 5. Bounce Data Table		
10 cm release	0 (1)	
20 cm release	0 (1)	4
30 cm release	0 (1)	
40 cm release	0 (1)	
6. Graph		
10 cm plot	(0) 1	
20 cm plot	(0) 1	
30 cm plot	(0) 1	0
40 cm plot	(0) 1	
Overall (connected) plot	(0) 1	
7. Stated Relationship	0 (1) 2	1
8. Extrapolation to 60 cm		
Predicted height	(0) 1	0
Explanation	(0) 1 2	

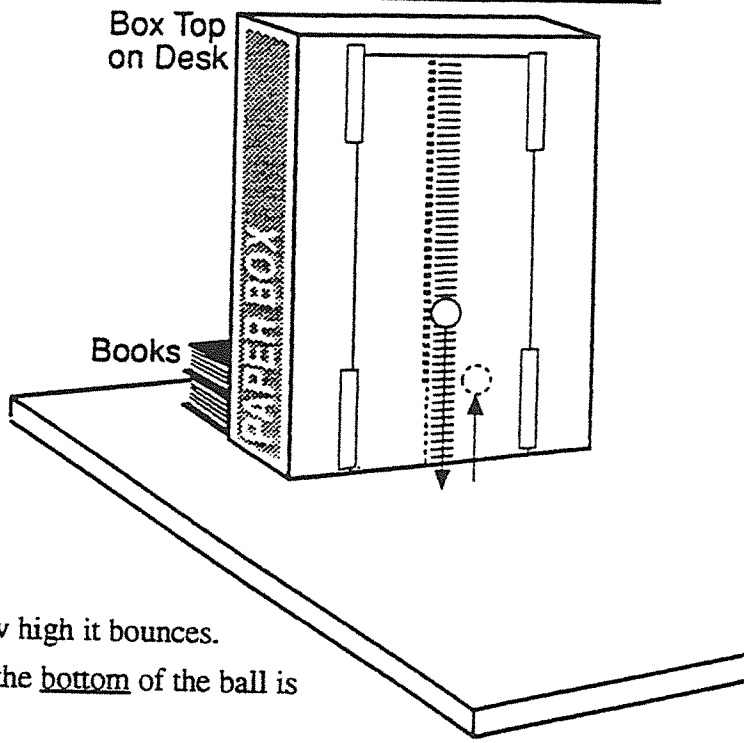
Total Score 5

Height of Bounce

Task: At this station, you will be measuring the height that a ping pong ball bounces when dropped from several different heights.

MATERIALS:

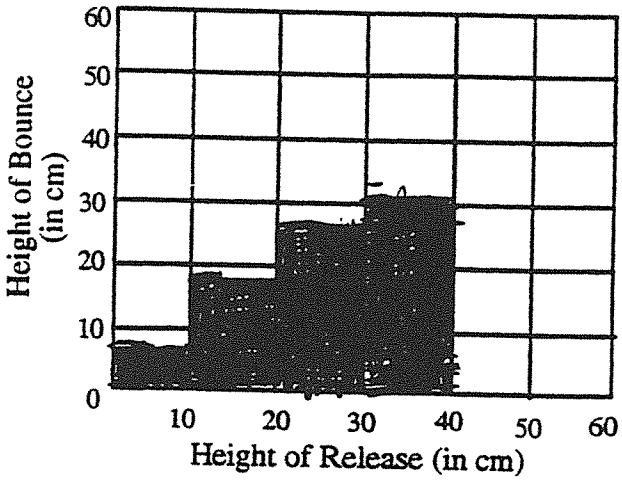
1 ping pong ball
1 box top with metric measurements,
(taped down or balanced with books)
calculator



DIRECTIONS:

1. Drop the ball from any height and observe how high it bounces.
2. Hold the ball near the scale on the box so that the bottom of the ball is level with the 10 centimeter mark.
3. Drop the ball and observe how high it bounces. The "height of bounce" is the distance from the table top to the bottom of the ball on the first bounce. (Practice a few times to make an accurate observation.
4. Record the height that the ball bounced on the data table. Round your answer to the nearest whole number.
5. Repeat steps 2 - 4 for release heights of 20 cm, 30 cm, and 40 cm.
6. Plot your results. Connect the points.

Height of Release	Height of Bounce (in centimeters)
10 cm	9.5
20 cm	18.3
30 cm	27
40 cm	30.1



NYS Alternative Science Assessment Project
NSF Grant #MDR-9154506

Copyright 1993
The University of the State of New York
The State Education Department
Albany, NY 12234

Student ID GMS 30 Male or Female (circle one)

Height of Bounce

Scoring Form (Maximum Score = 14 points)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Question	Circle Point Breakdown	Points Earned
4. and 5. Bounce Data Table		
10 cm release	0 (1)	
20 cm release	0 (1)	4
30 cm release	0 (1)	
40 cm release	0 (1)	
6. Graph		
10 cm plot	(0) 1	
20 cm plot	(0) 1	
30 cm plot	(0) 1	1
40 cm plot	(0) 1	
Overall (connected) plot	0 (1)	
7. Stated Relationship	(0) 1 2	0
8. Extrapolation to 60 cm		
Predicted height	(0) 1	1
Explanation	0 (1) 2	

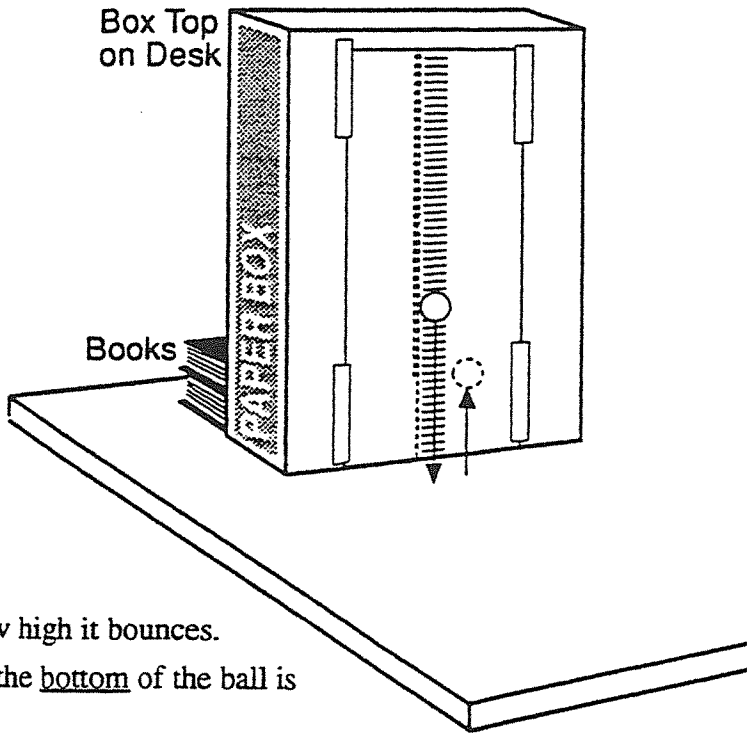
Total Score 6

Height of Bounce

Task: At this station, you will be measuring the height that a ping pong ball bounces when dropped from several different heights.

MATERIALS:

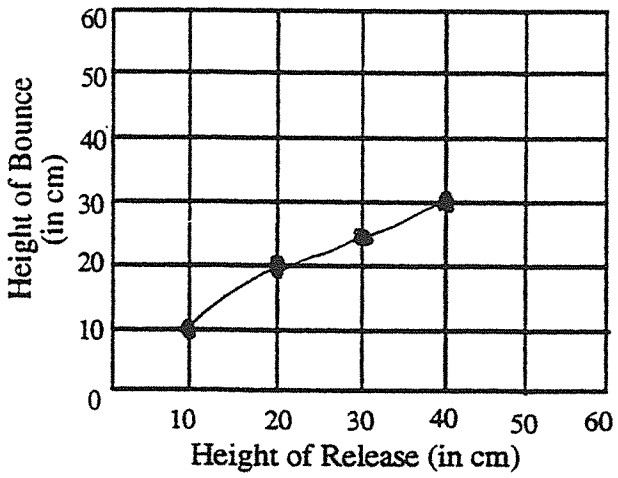
1 ping pong ball
1 box top with metric measurements,
(taped down or balanced with books)
calculator



DIRECTIONS:

1. Drop the ball from any height and observe how high it bounces.
2. Hold the ball near the scale on the box so that the bottom of the ball is level with the 10 centimeter mark.
3. Drop the ball and observe how high it bounces. The "height of bounce" is the distance from the table top to the bottom of the ball on the first bounce. (Practice a few times to make an accurate observation.
4. Record the height that the ball bounced on the data table. Round your answer to the nearest whole number.
5. Repeat steps 2 - 4 for release heights of 20 cm, 30 cm, and 40 cm.
6. Plot your results. Connect the points.

Height of Release	Height of Bounce (in centimeters)
10 cm	8cm=10
20 cm	19cm=20
30 cm	26cm=25
40 cm	30cm



NYS Alternative Science Assessment Project
NSF Grant #MDR-9154506

Copyright 1993
The University of the State of New York
The State Education Department
Albany, NY 12234

7. Based on your observations, write a generalized statement describing the relationship between the height of release and the height of bounce of a ping-pong ball.

The lower you bounced the ball from the higher it would bounce. When you bounce the ball from 40cm it will not bounce as high

8. If you were able to bounce this ball from a height of 60 cm, how high (in centimeters) would you predict that the ball would bounce? 50 cm

In the space below, explain how you used your data to make this prediction.

I figured that if the height was 3 cm when droped from 40cm, then 5 cm would be 40cm, and 60cm would Be 50cm.

NYS Alternative Science Assessment Project
NSF Grant #MDR-9154506

Copyright 1993
The University of the State of New York
The State Education Department
Albany, NY 12234

Student ID GMS 22 (Male) or Female (circle one)

Height of Bounce

Scoring Form (Maximum Score = 14 points)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Question	Circle Point Breakdown	Points Earned
4. and 5. Bounce Data Table		
10 cm release	0 (1)	
20 cm release	0 (1)	4
30 cm release	0 (1)	
40 cm release	0 (1)	
6. Graph		
10 cm plot	0 (1)	
20 cm plot	0 (1)	
30 cm plot	0 (1)	5
40 cm plot	0 (1)	
Overall (connected) plot	0 (1)	
7. Stated Relationship	0 (1) 2	1
8. Extrapolation to 60 cm		
Predicted height	0 (1)	3
Explanation	0 1 (2)	

Total Score 13

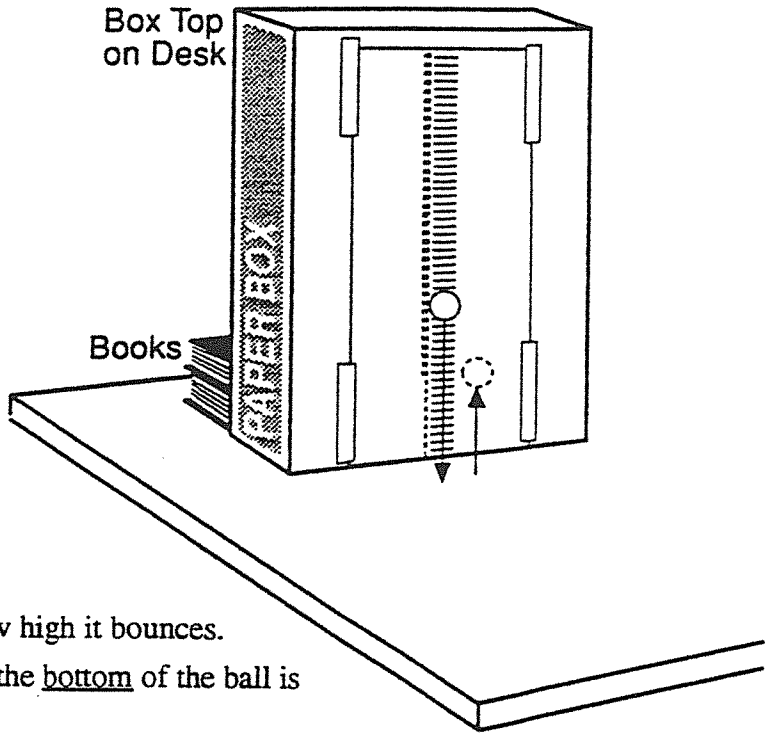
Height of Bounce

✓ 3

Task: At this station, you will be measuring the height that a ping pong ball bounces when dropped from several different heights.

MATERIALS:

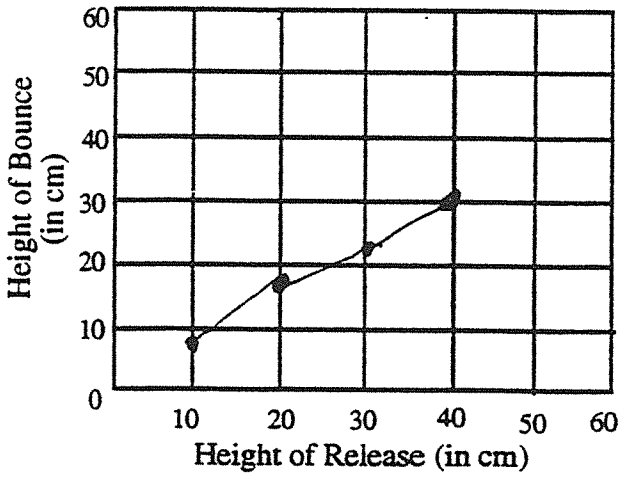
1 ping pong ball
1 box top with metric measurements,
(taped down or balanced with books)
calculator



DIRECTIONS:

1. Drop the ball from any height and observe how high it bounces.
2. Hold the ball near the scale on the box so that the bottom of the ball is level with the 10 centimeter mark.
3. Drop the ball and observe how high it bounces. The "height of bounce" is the distance from the table top to the bottom of the ball on the first bounce. (Practice a few times to make an accurate observation.
4. Record the height that the ball bounced on the data table. Round your answer to the nearest whole number.
5. Repeat steps 2 - 4 for release heights of 20 cm, 30 cm, and 40 cm.
6. Plot your results. Connect the points.

Height of Release	Height of Bounce (in centimeters)
10 cm	8 cm
20 cm	16 cm
30 cm	22 cm
40 cm	30 cm



NYS Alternative Science Assessment Project
NSF Grant #MDR-9154506

Copyright 1993
The University of the State of New York
The State Education Department
Albany, NY 12234

7. Based on your observations, write a generalized statement describing the relationship between the height of release and the height of bounce of a ping-pong ball.

for each 10 cm greater the ball Respond with 8 more cm to eac one. E 10-8, 20-16, 30-22 40-30

8. If you were able to bounce this ball from a height of 60 cm, how high (in centimeters) would you predict that the ball would bounce?

46 cm

In the space below, explain how you used your data to make this prediction.

Same as question no. 7

NYS Alternative Science Assessment Project
NSF Grant #MDR-9154506

Copyright 1993
The University of the State of New York
The State Education Department
Albany, NY 12234