Changing Ramp Heights
Task Information

Grade: 8th grade

Content:

Block I (Energy Sources and Issues) Section I;B.1, B.2, B.3. page 7.

Format: Manipulative

Purpose: The students will determine the relationship between the height of a ramp and the energy of the ball rolling down the ramp.

Skills:

Primary: Measuring, interpreting data, calculating
Secondary: Recording data, observing

Time: 10 - 15 minutes

Materials:

Teacher:

- scissors or craft knife
- black or blue marker

Per student or station:

- three(3) books of the same size
- plastic cup or bowl
- 30 cm ruler w/ center groove
- golf ball
- metric measuring tape
- masking tape
- calculator

Preparation:

- Cut a hole in the side of the plastic cup or container large enough to allow the golf ball to roll through it freely.
- Designate the part of the cup that the students will be measuring from (back or front)
- You must have a large flat surface to do this task; laboratory tables, cafeteria tables, or the floor work well. A single student desk is **not** large enough.
- A ball release point should be marked on the ramp or ruler with permanent marker.

Extension/Modifications:

- Uniform wood blocks may be used in place of the books for the ramp.
- A rubber ball may be substituted for the golf ball.
- A piece of wooden molding may be used in place of the ruler for the ramp.

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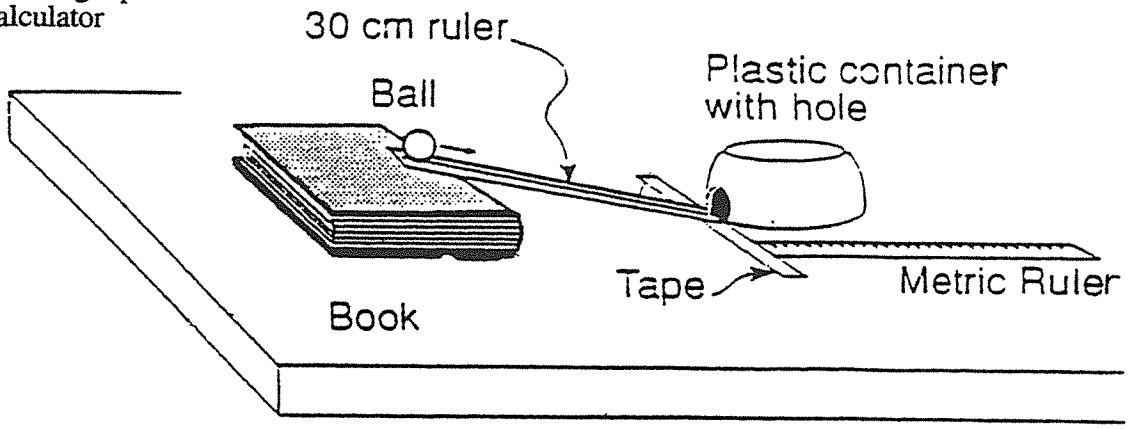
Changing Ramp Heights

Task: At this station you will be measuring the effect the height of a ramp has on the distances a ball is able to move a stationary cup.

Materials

- 3 books of the same size
- plastic cup or bowl
- ruler with a center groove
- golf ball
- metric measuring tape
- masking tape
- calculator



Directions

1. Be sure your equipment is set up exactly as it appears in the diagram above. Make sure the cup is placed with the hole facing the ruler. Rest the ruler on the books at about 5 cm from the end.

   ***** The ball must roll into the cup *****

2. Release the golf ball about 2 cm from the top of the wood.
3. Measure, in centimeters, how far the ball moved the cup. Be sure to measure from the front of the cup.
4. Record your measurement in the data table on the answer sheet.
5. Conduct two (2) more trials for this height. Find the average of **all** three (3) trials to the nearest whole number and record it in the data table on the answer sheet.
6. Add one book to the ramp and repeat steps 2 - 5.
7. Add a third book to the ramp and repeat step 2 - 5.
8. Answer questions 2 - 5 on your answer sheet.

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Changing Ramp Heights
Answer Sheet

1. Record your measurements on the data table below.

Distance cup moved - (in centimeters)

Number of Books	Trial 1	Trial 2	Trial 3	Average
1				
2				
3				

2. Write a sentence comparing the effect of ramp height on the average distance the cup moved.

_____

_____

_____

_____

3. In terms of kinetic and potential energy, explain why changing the height of the ramp produced different results.

_____

_____

_____

_____

Please Continue on the Next Page

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4. Was your data the same for all three trials when three books were used?

_____

Explain what might have caused this.

_____

_____

_____

_____

5. Why does a scientist use more than one trial when conducting an experiment?

_____

_____

_____

_____

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Changing Ramp Heights - Scoring Rubric

Maximum Score - 10 points

1. Data Table - Distance the Cup Moved — 3 points total

Point Criteria:

- Allow 1 point for data collection taken three times (3 trials)
- Allow 1 point for correctly averaging and rounding at least two (2) of the three(3) distances.
- Allow 1 point for data showing an increase in the average distance as the number of books is increased.

2. Effect of Ramp Heights on Distance — 2 points total

Point Criteria:

- Allow 1 point for identifying height of the ramp as the variable.
- Allow 1 point for an explanation that states that the distance the cup moved is directly related to the height of the ramp.

Sample of acceptable responses:

- As the ramp was moved higher, the cup moved further.
- When the ramp was low, the cup did not roll as far as when it was higher.

3. Explanation of Results — 2 points total

Point Criteria:

- Allow 1 point if the student states that increased energy of the ball leads to increase movement of the cup.
- Allow 1 point if the student states that the increased ramp height is the cause of the increase in the ball's energy.
  Allow 2 points for both cause and effect

Sample of acceptable answers:

- When there were more books, the ball had more energy and moved the cup further.
- When the ramp height was increased the potential energy was increased and led to more kinetic energy to move the cup.

4. Variation in Data — 2 points total

Point Criteria:

- Allow 1 point if the student's response matches his/her data.
- Allow 1 point if the student relates the change in distance to the human factor involved in the experiment.

Sample of acceptable responses:

- The starting position of the cup may have varied.
- The ball may have been placed at different starting positions.
- Human element
- Environmental factors

5. Multiple Trials — 1 point total

Point Criteria:

- Allow 1 point if the student's response states that several trials validate the data and allow for human error.

Highest possible score - 10 points

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Student ID _____ **Scoring Form - Changing Ramp Heights**
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
1. Data Table - distance the ball moved		
Three trials completed	0 1	_____
Average	0 1	_____
Direct relationship shown	0 1	_____
2. Effect of ramp heights on distance cup moves		
Correct identification of variable	0 1	_____
Correct explanation	0 1	_____
3. Explanation of results	0 1 2	_____
4. Variation in data		
Response matches data	0 1	_____
Correct explanation	0 1	_____
5. Multiple trials	0 1	_____

Total Score _____
Maximum Score - 10 points

Student ID 01 **Male** or **Female** (circle one)

Changing Ramp Heights

Scoring Form (Maximum Score = 9 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
1. Data Table - Distance the ball moved		
Data Entry	0 (1)	1
Data Collection	0 (1)	1
2. Effect of Ramp Heights on Distance cup moves		
Correct identification of variable	0 (1)	1
Correct explanation	(0) 1	0
3. Explanation of Results	0 1 (2)	2
4. Explanation of Scientific Method		
Response matches data	0 (1)	1
Correct Explanation	(0) 1	0
5. Data Collecting	(0) 1	0

Total Score 6

Changing Ramp Heights
Answer Sheet

1. Record your measurements on the data table below.

Distance Cup Moved (in centimeters)

Number of Books	Trial 1	Trial 2	Trial 3
1	6 cm	7cm	7cm
2	20.5cm	23.5cm	20.5cm
3	36cm	37cm	37cm

2. Write a sentence comparing the effects of ramp height on the distance the cup moved.

With three blocks it ~~Re~~ went the farthest. With one blocks it went the least.

3. Write a sentence explaining why changing the height of the ramp produced different results.

More of an angle caused the ball to go faster.

Please continue this task on the next page

4. Was your data the same for all three trials at each height? no

Explain what might have caused this.

The weight of the ball and the bigger Angle caused the ball to go faster And move the cup farther.

5. Why does a scientist use more than one trial when conducting an experiment?

For different results.

#12

Student ID 02 **Male or Female** (circle one)

Changing Ramp Heights

Scoring Form (Maximum Score = 9 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
1. Data Table - Distance the ball moved		
Data Entry	0 (1)	1
Data Collection	0 (1)	1
2. Effect of Ramp Heights on Distance cup moves		
Correct identification of variable	0 (1)	1
Correct explanation	0 (1)	1
3. Explanation of Results	0 1 (2)	2
4. Explanation of Scientific Method		
Response matches data	0 (1)	1
Correct Explanation	(0) 1	0
5. Data Collecting	(0) 1	0

Total Score 7

4. Was your data the same for all three trials at each height? No

Explain what might have caused this.

Because of force of speed.

5. Why does a scientist use more than one trial when conducting an experiment?

Notes, Motion and effort

Student ID 03 Male or Female (circle one)

Changing Ramp Heights

Scoring Form (Maximum Score = 9 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
1. Data Table - Distance the ball moved		
Data Entry	0 (1)	1
Data Collection	0 (1)	1
2. Effect of Ramp Heights on Distance cup moves		
Correct identification of variable	0 (1)	1
Correct explanation	0 (1)	1
3. Explanation of Results	0 1 (2)	2
4. Explanation of Scientific Method		
Response matches data	0 (1)	1
Correct Explanation	0 (1)	1
5. Data Collecting	0 (1)	1

Total Score 9

Changing Ramp Heights
Answer Sheet

1. Record your measurements on the data table below.

Distance Cup Moved (in centimeters)

Number of Books	Trial 1	Trial 2	Trial 3
1	12.5	17	15.7
2	42.3	40	38.5
3	off the table	off the table	51

2. Write a sentence comparing the effects of ramp height on the distance the cup moved.

The Higher the ramp is the farther the cup moves

3. Write a sentence explaining why changing the height of the ramp produced different results.

The ball can go down faster from a different height

Please continue this task on the next page

4. Was your data the same for all three trials at each height? no

Explain what might have caused this.

The ball might have started at a different starting point. The ramp is smooth and the structure of the ball might have been different.

5. Why does a scientist use more than one trial when conducting an experiment?

to see if it works