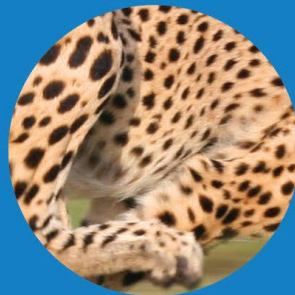


“Energize Claims and Evidence through Smithsonian Science for the Classroom”

NSTA National Conference
Denver 2024

Hoover Herrera
Carolina





Marble Collisions



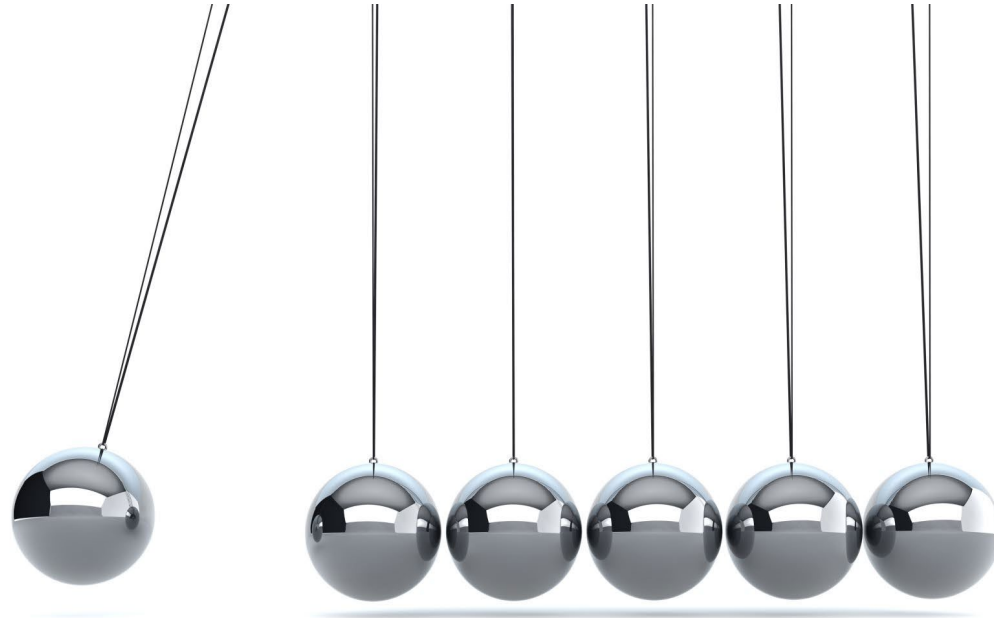
How does motion
energy move and
change?

Scientists Investigate: How does motion energy move and change?

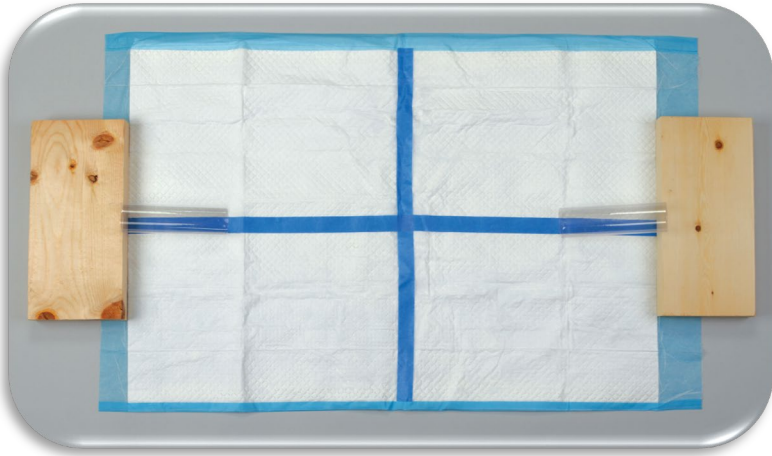


Make a Prediction

Predict what will happen when one ball is pulled back.




Scientists Investigate: How does motion energy move and change?



Scientists Ask Questions

What questions could you ask about how motion energy moves and changes in a collision using these materials?

Our Questions



STEM Notebook

Scientists
record their
thinking.

Date

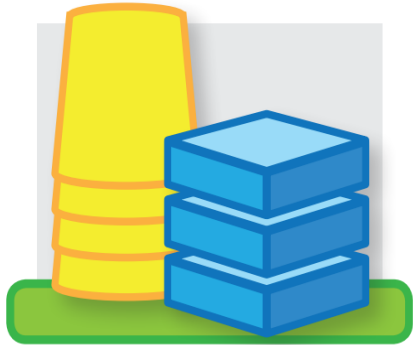
Lesson 4 Notebook Sheet A

Collision with One Moving Marble

Prediction:

Collision 1	Marble 1	Marble 2
Before collision	Moves fast toward Marble 2	Isn't moving
After collision		

Scientists Investigate: How does motion energy move and change?



Materials Manager

Collects, cleans up, and puts away materials neatly.



Organizer

Makes sure group members work together and complete work on time.



Questioner

Asks questions of group members to make sure all points of view are considered.



Speaker

Shares the group's final work or ideas with the whole class.

Groups of 4

Materials Manager

Organizer

Questioner

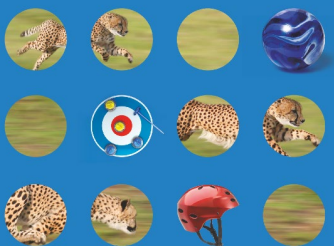
Speaker



Student Activity Guide: Complete Steps 1-9

Smithsonian **SCIENCE**
for the classroom

**HOW DOES
MOTION ENERGY
CHANGE IN A COLLISION?**



PHYSICAL SCIENCE STUDENT ACTIVITY GUIDE

Lesson 4: Marble Collisions

We are investigating:
**How does motion energy move
and change?**

Materials

For each student

- STEM Notebook
- 1 Lesson 4 Notebook Sheet A
- 1 Lesson 4 Notebook Sheet B

For each group of four students

- 2 Marbles
- 2 Plastic tubes
- 2 Wood blocks
- 1 Mat
- 1 Ruler
- Tape



Knowing about collisions can help
you play the game of marbles.

Procedure

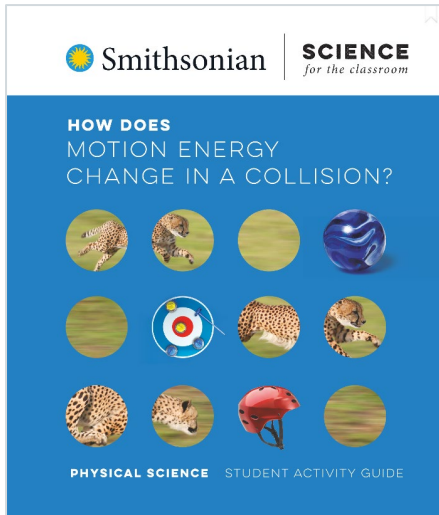
1. Collect your materials.
2. Put your mat flat on the table or floor.
3. Use the tape to make a cross on the mat:
 - Put one piece of tape down the middle one way.
 - Put another piece of tape down the middle the other way.



Use the folds of the mat to make your cross.

4. Put one marble in the center of the cross.

Student Activity Guide: Complete Steps 1-9



5. Set up your wood block:

- Lay your wood block down flat.
- The block should be on a long arm of the cross.
- The block should be 20 cm from the marble.



The front of the block should be 20 cm from the marble.

6. Rest one end of a tube on the top of the block:

- The bottom of the tube should be on the tape.
- The tube should point at the center of the marble.



Make sure your tube is pointing at the center of the marble.

7. Practice rolling a marble down the tube:

- The moving marble should hit the center of the marble that isn't moving.

Group Work

One person could hold the tube while another person rolls.

Stay Safe!

Don't get too close to other groups. Don't walk near the path of a rolling object.

8. Roll the marble down the tube two or three times and observe carefully.

Stop & Check

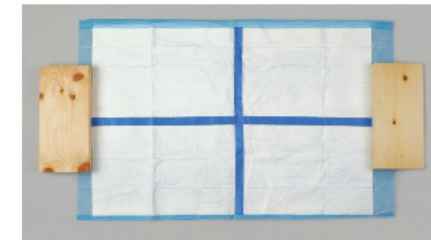
Are you looking at how speed *and* direction change after the collision?




9. Write your observations on the notebook sheet.

10. Set up two blocks at opposite ends of the mat:

- Lay each block down flat.
- Each block should be at the end of a long arm of the cross.



The front of the block should be at the end of a long arm of the cross.



STEM Notebook

Scientists
record their
thinking.

Date

238 How Does Motion Energy Change in a Collision?

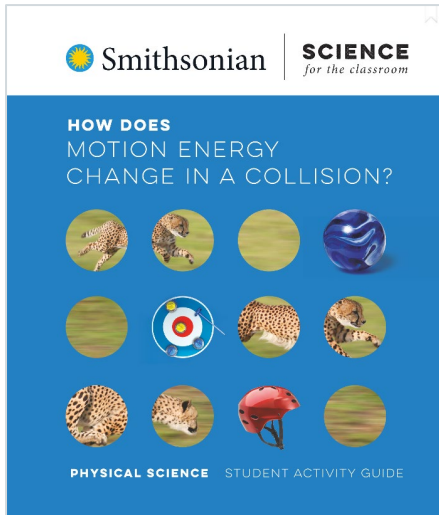
Collision with Two Moving Marbles

Lesson 4 Notebook Sheet B

Prediction:

Collision 1	Marble 1	Marble 2
Before collision	Moves fast toward Marble 2	Moves fast toward Marble 1
After collision		

Student Activity Guide: Complete Steps 10-14



7. Practice rolling a marble down the tube:

- The moving marble should hit the center of the marble that isn't moving.

Group Work

One person could hold the tube while another person rolls.

Stay Safe!

Don't get too close to other groups. Don't walk near the path of a rolling object.

8. Roll the marble down the tube two or three times and observe carefully.

Stop & Check

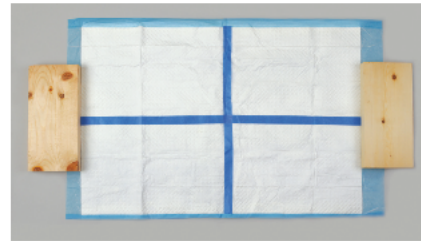
Are you looking at how speed and direction change after the collision?



9. Write your observations on the notebook sheet.

10. Set up two blocks at opposite ends of the mat:

- Lay each block down flat.
- Each block should be at the end of a long arm of the cross.



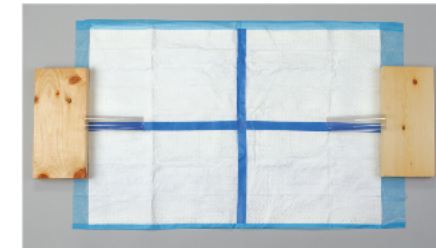
The front of the block should be at the end of a long arm of the cross.



4

11. Rest one end of a tube on top of each block:

- Each tube should be over the tape.



Make sure your tubes are pointing toward each other.

12. Practice rolling a marble down each tube:

- The marbles should hit each other in the center of each marble.

Group Work

The Speaker could say "Go" to make sure that the marbles are released at the same time.

13. Roll the marbles down the tubes two or three times and observe carefully.

Stop & Check

What can you do differently if the marbles keep missing each other?

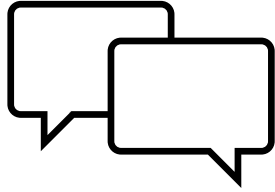


14. Record your observations on the notebook sheet.



5

Scientists Explain: How does motion energy move and change?



How did the speed and direction of the marbles change when you made a moving marble collide with a marble that wasn't moving?

How did the speed and direction of the marbles change when you made two moving marbles collide?

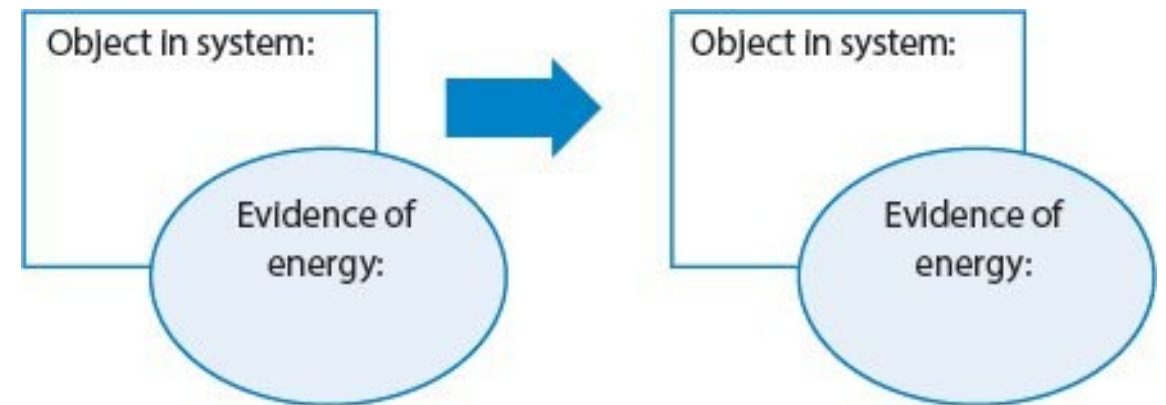
How many times did you do each type of collision?

How many times did you think you needed to do each type of collision?



Energy Models

Draw an energy model showing how the motion energy of a moving marble moved and changed when it hit a marble that wasn't moving.



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