

Workshop 5.

Keep On Rolling

Roller coasters are filled with twists and turns, as changes in height and direction supply a variety of push and pull forces. In this workshop, first-grade students build on their prior experience with rolling objects. By designing and constructing their own roller coaster made from ramps, cardboard tubes, and flexible tubes, the students experiment with ways to get a marble from the top of a table into a bucket on the floor, some distance away.

On-Site Activities and Timeline

Getting Ready

30 minutes

Share What You Learned

For homework last time, you were asked to answer some questions about ramps. Take a few minutes to share your responses with the group or a partner.

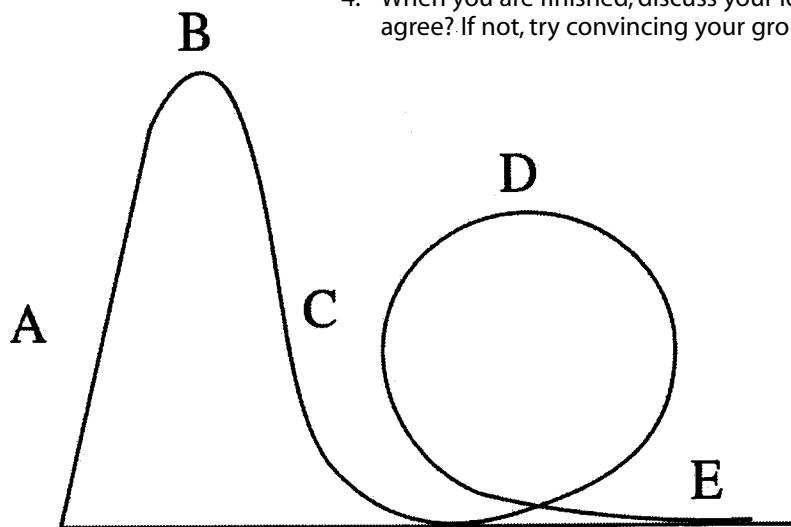
A Penny for Your Thoughts on the 10-Cent Experiment

In the video for Workshop 4, you saw an experiment involving three soup cans rolled down a ramp—one empty can, one with broth, the third with a thick soup. Perhaps you even tried it yourself. The empty can reached the bottom of the ramp last. What do you think would happen if you used two empty cans of different diameters? What would happen if you changed the surface of the ramp? If you allowed the three cans to continue to roll after reaching the bottom of the ramp, which would roll the greatest distance? Share your ideas with the other participants.

What Does It Feel Like To Ride on a Roller Coaster?

The picture below shows a roller coaster marked with points A, B, C, D, and E. Work with a partner and discuss the questions below.

1. Imagine you are riding in the roller coaster. What do you feel at each point?
2. At which point would you expect the highest speedometer reading? The lowest? Are there two or more points where you would expect the reading to be the same? Are there any points where you would expect the speedometer to read zero?
3. Draw an arrow at each point to indicate the direction of the force you feel.
4. When you are finished, discuss your ideas with the entire group. Do your ideas agree? If not, try convincing your group members of your point of view.



On-Site Activities and Timeline, cont'd.

Watch the Workshop Video

60 minutes

As you watch the video, look for the "10-Cent Experiment." You may want to try it yourself at home. Instructions can be found on page 43.

Going Further

30 minutes

Force and Motion in the Amusement Park

Work with your partner to come up with a list of your favorite amusement park rides. Do the following activities together.

1. Imagine yourself on these rides, as you did earlier with the roller coaster. Describe the forces you feel during the course of each ride. These forces may change or may remain constant depending on the rides you select.
2. Now imagine each ride has a speedometer that you can see. Describe where in the ride the speedometer would indicate the slowest speed, and where it would show the fastest speed. Is there a place where it would read zero?
3. Are there any relationships between each ride's speed and the force you feel? Describe any connections you see.

Try It Online!

Now that you've thought about some amusement park rides, go to some of the following Web pages where you will be able to explore further:

<http://www.learner.org/exhibits/parkphysics/carousel.html>
<http://www.learner.org/exhibits/parkphysics/bumpcars.html>
<http://www.learner.org/exhibits/parkphysics/freefall.html>
<http://www.learner.org/exhibits/parkphysics/pendulum.html>

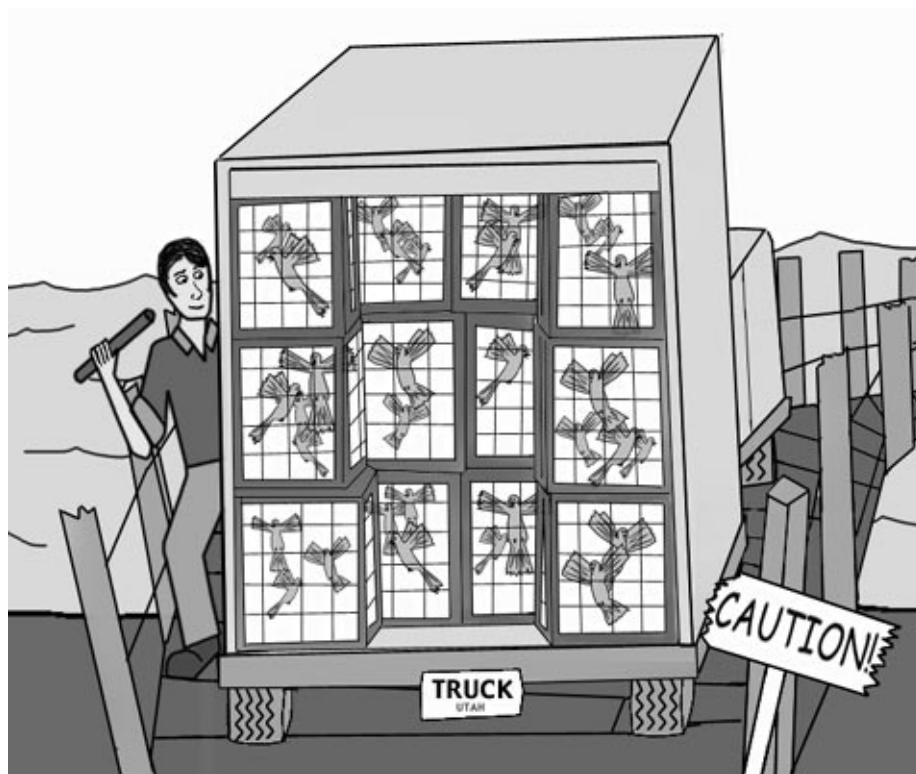
For Next Time

Homework Assignment

Canary Physics

Based on what you now know about forces, see if you can solve the following riddle. Be prepared to discuss your ideas with the group during your next session.

A man driving a truckload of canaries to a pet store comes to a bridge that is old and in bad condition. A warning sign tells the driver the weight limit the bridge can support. The bridge can support the weight of the truck and the driver, but not the added weight of the canary cargo. The driver, however, has studied force. He picks up a stick and bangs on the side of the truck until all the canaries start flying around in their cages. Then he quickly hops in the truck and starts to drive across the bridge. If all the canaries continue flying as he drives, does he make it across the bridge without it breaking?



To check your answer, go to the *Science in Focus: Force and Motion* Web site at:

<http://www.learner.org/channel/workshops/force>

For Next Time, cont'd.

The 10-Cent Experiment

Materials:

A smooth board

Two wooden toy building blocks, one twice as long as the other

Instructions:

1. Drop the two blocks together from the same height, and notice how they fall.
2. Now, create a steep ramp by propping the board against a wall or firm support.
3. Slide the two blocks down the ramp.

Questions:

Did the falling blocks behave the same as the blocks that slid?

Why or why not?

Notes
