

Workshop 4.

On a Roll

The force of gravity makes a ball roll when it is placed on an incline. In this workshop, first-grade students roll balls of different sizes, masses, and materials down ramps of varying heights, comparing their speeds. The students then experiment by replacing the ramp with a cardboard tube, and try to determine how the tube must be oriented to allow the ball to roll, much as it rolled down the ramp.

On-Site Activities and Timeline

Getting Ready

30 minutes

Is Friction a Good or Bad Thing?

1. Trade your Congressman Notsosmart letter with a partner. Read your partner's letter and discuss one thing you really liked about it, and one thing (if anything) with which you disagree. Share your results with the rest of the group.
2. With your partner, make two lists:
 - a. A list of situations in which you would like to have lots of friction, and why.
 - b. A list of situations in which you would like to have as little friction as possible, and why.Share your results with the rest of the group.

A Penny for Your Thoughts on the 10-Cent Experiment

In the video for Workshop 3, you saw an experiment in which the same car was rolled down a ramp over three different surfaces. Perhaps you even tried it yourself. What other materials could you have placed on the ramp? Will the car always roll down the ramp? How could you change the experiment to make the car roll faster or slower? If you turned the car over on its roof, would it slide down the ramp? Share your ideas with the other participants.

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 38.

On-Site Activities and Timeline, cont'd.

Going Further

30 minutes

Designing a Better Roller Coaster

Roller coasters are great places to experience force. However, a roller coaster that is fun for a small child might be rather boring for an adult, while an adult-style roller coaster would be much too scary for a child. Imagine going to work each day just to design roller coasters. There are people whose job it is to do just that. Today it is your task.

1. Work with a partner to design:
 - a. A roller coaster for first-grade students
 - b. A roller coaster for adults

Describe the hills, loops, twists, and turns you plan to include in each roller coaster, and draw a sketch of how it will appear from the side.
2. Present your design to the whole group. What things should be the same about both roller coasters to create the desired "thrill effect"? What things should be different?

Try It on the Web!

Now that you've designed your own roller coaster, try doing it again online at <http://www.learner.org/exhibits/parkphysics/coaster/> where you will be able to test whether your roller coaster design is safe and fun.

For Next Time

Homework Assignment

Ramping Up

In your journal, make a list of all the places you can think of where ramps are used to move an object from one location to another. Write a response to the following questions:

1. When do you want a ramp that is inclined at a high angle? At a low angle?
2. Why does the angle of a playground slide change near the bottom?
3. When you drive up a mountain, the road winds around gradually in a "switchback." Why doesn't the road go straight up the side of the mountain like a ramp?
4. Ramps sometimes provide an alternative to stairs. If there were no elevator, would you choose the stairs or a ramp to go up to the second floor? What are the reasons for your choice? Would your answer change if you were going down?

For Next Time, cont'd.

The 10-Cent Experiment

Materials:

A smooth board

Three identically sized soup cans:

- A can of thick soup, such as split pea
- A can of broth
- An empty can (with the top and bottom removed)

Instructions:

1. Create a ramp by propping the board against a wall or firm support.
2. Roll each can down the ramp and observe its motion.

Questions:

Which can reaches the bottom first? Which reaches the bottom last?

Why?