

CURIOSITY AT HOME

USE THE FORCE(S)!



Can you use forces to make objects move...without touching them? There are invisible forces at work on Earth and in space which move and shape our world. Magnetic fields, moving air, gravity, sound waves, electricity can cause forces, or pushes and pulls, that change the motion of an object.

Your challenge is to harness the forces of the world around you to move a ball—without giving it a physical push with any solid object.

MATERIALS

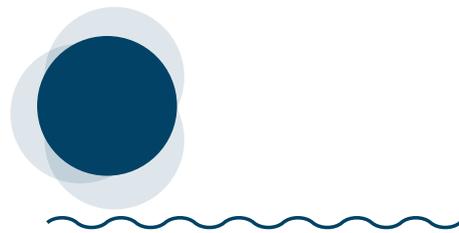
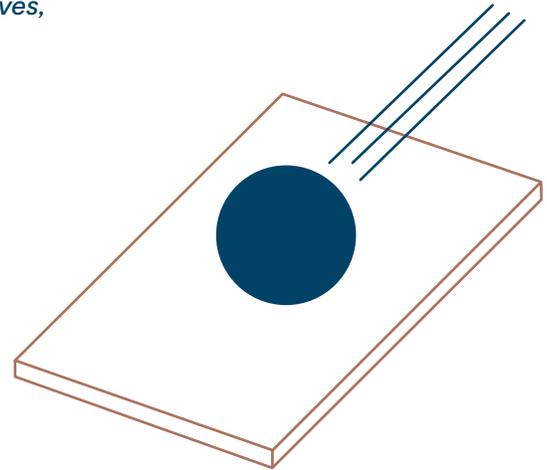
- One ball (any size)
- Any available objects to get the ball moving
- Paper or your science notebook
- Pencil

PROCEDURE

- Get the ball rolling! Experiment with different techniques to get the ball started, without pushing it with your body or another solid object.
- Build a course inside or outside your house to keep your ball rolling as long as possible, while only being moved by invisible forces!

Suggestions to get you started:

- Engineer a ramp to create potential energy on the ball with the force of gravity.
 - Try blowing on the ball. Can you use or create a tool to help direct your air more forcefully on the ball? Can you have air move your ball in a different way?
 - Can you use vibrations to move your ball? Try jumping around your ball to shake or vibrate the ground. What surfaces might vibrate more, better moving your ball?
 - Can liquids push your ball? Does your ball float? How could you make the liquid move, so it pushes or pulls the ball?
 - Will magnets move your ball?
- What other ways can you think of to move it? Get creative!



Experiment continued on next page...



Show us how you're being curious! Share your results with us.

PACIFIC
SCIENCE
CENTER



CURIOSITY AT HOME

USE THE FORCE(S)!



TRY THIS

- Which invisible force makes your ball move the fastest?
- How far can you make your ball move? Measure it!
- Does using a different size or weight ball change how the forces work on it?
- Can you combine methods to make it move farther or faster?

DID YOU KNOW

A force can be described as a push or a pull which moves an object. Invisible forces such as gravity and electro-magnetism are at work both here on Earth and in space. Gravity keeps people and objects from floating off the surface of the Earth, and is also the force which keeps our Earth and other planets orbiting around the Sun! It is such an important force that human bodies are adapted to the Earth's gravity we experience all the time. Astronauts on the International Space Station are studying the effects of spending time in space with very little gravity (called a microgravity environment), to learn how to prepare human bodies for long term space missions.

www.nasa.gov/hrp/bodyinspace



Show us how you're being curious! Share your results with us.

PACIFIC
SCIENCE
CENTER



CURIOSITY AT HOME

USE THE FORCE(S)!



3–5 GRADE EXPLORATION

Explore the following questions and write your observations in your science notebook.

Make a prediction—will a heavier ball or a lighter ball hit the ground first when dropped from the same height? Write your prediction in your science notebook, test it, and write your results!

Slowball Challenge

How slowly can you make a ball move from the top of a ramp to the floor?

MATERIALS

- a small ball (ex. marble or bouncy ball)
- a large flat surface (ex. piece of cardboard)
- something to prop up your board (ex. books or cans)
- any craft materials (ex. clay, sticks, corks, yarn)
- timer
- science notebook
- pencil

PROCEDURE

- Create a ramp using a piece of cardboard or any other larger, flat surface could work.
- Prop the surface up on objects to change the angle.
- Use the timer to record how fast the ball moves from the top of the ramp to the bottom. Record your data in your science notebook.
- Use any other materials to create a course or form obstacles which slow the ball down, but don't stop it. The goal is to have the ball move from the top of the ramp to the bottom without the help of an additional push.
- Use the timer and record your trial runs in your science notebook. How slow can you go? What forces were you using?



Show us how you're being curious! Share your results with us.

PACIFIC
SCIENCE
CENTER

