

# Marble on the Move

For ages 10 and older.

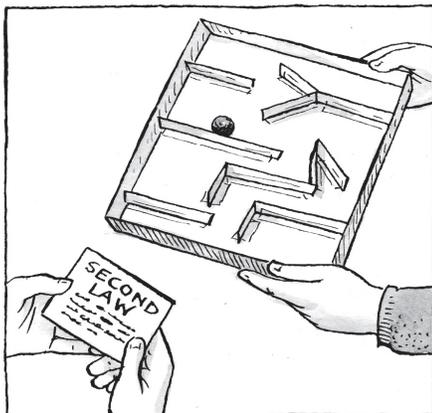
Sir Isaac Newton studied other scientists' ideas and thought a lot about how things on Earth and in the universe move. After a great deal of work, he developed three important laws that explain how and why things move as they do. His three laws of motion are:

1. An object at rest will stay at rest, and a moving object will keep moving in a straight line with constant speed until a force acts on the object.
2. An object accelerates (speeds up) because a force acts upon it.
3. For every action there is an equal and opposite reaction.

In this activity, you will make a maze and use a marble to investigate these laws.

## You will need

- cardboard box (flat lid of a shoebox is best)
- 4 of each of the following sized rectangles (made from oak tag, index cards, or manila folders) 1 by 2 inch, 1 by 3 inch, and 1 by 5 inch
- masking tape
- 2 small marbles
- pencil
- 3 index cards



## What to do

1. Work with a partner. Label each of your index cards with a different law of motion.
2. Work together to make a maze by taping the rectangles to the inside base of the box (all walls should be 1 inch high). Make the tape the same length as the long side of the rectangle. Place the tape on a long side of the rectangle so half the tape sticks to the rectangle and half does not. Tape the rectangle to the inside base of the box so that it stands up. Secure the rectangle by taping its opposite side to the base.
3. Continue taping rectangles to the base to complete the maze. Leave spaces so a marble can travel from one end to the other.
4. Conduct the following three steps with the marble:
  - Place the marble in the maze so that it is still. How can you make the marble move? How can you make the marble move faster? What is the force responsible for making the marble move?
  - Place the marble at rest. Why does the marble stay still? Tilt the box and observe. What causes the marble to move? What causes the marble to stop or slow down?
  - Place one marble in the maze. Roll another marble into it. What happens to the two marbles? Where does the energy of the first marble get transferred?
5. After you have done these three tasks, look at your index cards that contain Newton's laws of motion. Match each law to a different step you performed. Explain your choices.

## Learning More

### Isaac Newton: The Greatest Scientist of All Time

by Margaret J. Anderson.  
Enslow, 1996.

*Presents the life and work of Isaac Newton as well as hands-on experiments related to Newton's theories of motion and gravitation.*

### Janice VanCleave's Physics for Every Kid: 101 Easy Experiments in Motion, Heat, Light, Machines, and Sound

by Janice Pratt VanCleave.  
Wiley, 1991.

*Provides a number of easy-to-do experiments and activities that illustrate physics principles.*

ZOOM's 3 Puck Chuck

[pbskids.org/zoom/games/3puckchuck](http://pbskids.org/zoom/games/3puckchuck)

*Features a game in which players must account for Newton's laws of motion as they adjust the speed, direction, and physical properties of a virtual puck.*

## Newton's Laws of Motion

Sir Isaac Newton was born in 1642. He studied at the University of Cambridge in England. Many scientists of his time wanted to know more about motion on Earth and the motions of the planets. Newton was the first to understand both of these. His three laws of motion have helped scientists understand orbits and develop rockets and spacecrafts.

**Answer:** The first step demonstrates Newton's second law of motion, the second step shows his first law of motion, and the third step illustrates his third law of motion.