



## Going in Circles

Investigate what keeps an object in orbit.

### Understanding orbits

What happens when a batter hits a baseball? The force of the bat pushes the ball forward in a straight line. At the same time, gravity pulls the ball down. The harder the ball is hit, the farther it will go and the longer its arc will be.

Friction with the air slows the ball. To avoid that friction, imagine the batter is standing on top of a mountain that reaches above Earth's atmosphere. She smacks the ball so it moves at 8,000 meters per second. The arc of the ball's fall matches Earth's curve. The ball keeps falling, but it never hits the ground. It falls *around* the Earth. The ball is in orbit.

For an object to be in orbit, its forward motion and falling motion must be in balance. A satellite's inertia—the forward motion it got from a boost from a rocket—makes it tend to keep moving at the same speed in the same direction. Meanwhile, Earth's gravity pulls on the satellite, making its path curve toward Earth. If the satellite's forward motion is fast enough, it will not fall into Earth, but will keep moving in a curved path around and around Earth. The balance between forward motion and falling motion keeps the satellite in orbit.

### Do the activity

*Before you begin the activity, put on your safety goggles.*

1. Tie a 1-meter piece of string to a small stuffed toy.
2. Have one student swing the toy in a circle around his or her head so that the toy is in orbit. The toy represents an object such as a satellite orbiting the Earth.
3. Have the student swing the toy more quickly. What happens to the toy's orbit when the toy speeds up?  
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4. Have the student swing the toy more slowly. What happens to the toy's orbit when the toy slows down?  
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### Interpret your results

1. Did the toy's orbit change when the student swung the toy more quickly and then more slowly? If so, why did it change?  
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### MATERIALS

*For each group of students:*

- > Safety goggles for each student
- > String (1 meter)
- > Small stuffed toy



2. If the toy represents something orbiting Earth, what does the string tied to the toy represent?

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3. If the student let go of the string while the toy was orbiting around his or her head, what would happen to the toy? Why?

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