

A replica of Sputnik 1, the first artificial satellite in the world to be put into outer space: the replica is stored in the National Air and Space Museum.
<http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1957-001B>
NSSDC, NASA, 2004

Vocabulary:

trajectory
velocity
orbit
gravity

Subject Areas for Further Study:

History:

Cold War, Space Race, NASA, Sir Isaac Newton

Science:

Newton's Laws of Motion, Gravity, Velocity

Geography:

Compare the U.S.A. and Russia on a globe.

Media:

October Sky, PG, 108 min.

The true story of Homer Hickam, a coal miner's son who was inspired by the first Sputnik launch to take up rocketry against his father's wishes.

On October 4, 1957 the Soviet Union launched the first artificial satellite. Named Sputnik, the small metal ball with four antennas was the first man-made object to ever circle the earth in orbit. The world was amazed at the achievement, and Americans especially were unnerved by a Russian object orbiting in plain view over the United States at the beginning of the Cold War. This led the U.S. to form the agency which would soon become NASA, and was the beginning of the Space Race.

The following worksheet is designed to guide students through a simple experiment to demonstrate how a ball falls around a curved path known as a **trajectory**. The trajectory changes depending on how fast the ball is thrown (**velocity**), and at what angle.

Experiment with different trajectories by throwing the ball straight up, level with the ground, and at various angles. Measure to see how far the ball goes, and determine what angle makes the ball go the farthest.

Diagram the trajectories on the following worksheet and answer the questions.

Bonus Question: Who was the first person to calculate that it was possible for an object to fall all the way around the world?

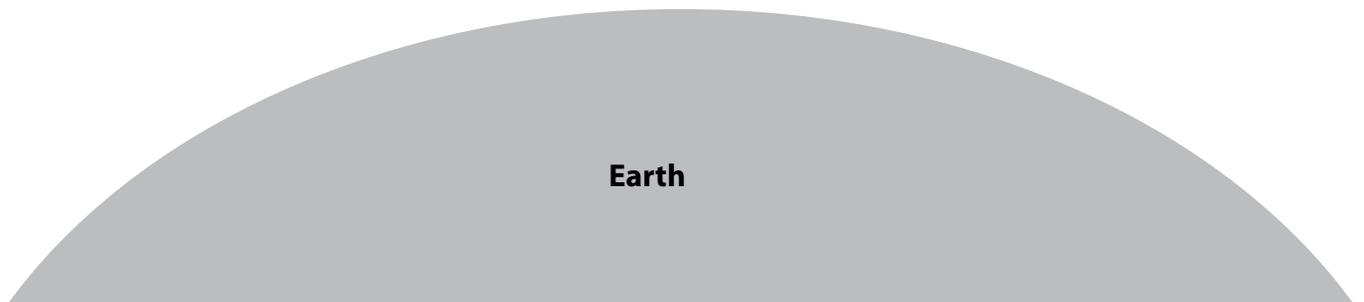
A: Sir Isaac Newton published this calculation among other physical laws in 1687. That's 270 years before Sputnik. He was inspired by an apple that fell from a tree and had to invent a new system of math before he could arrive at the right solution. That system of math is now known today as calculus.

Draw the Path of the Ball Through the Air. This path is called a _____

If the Trajectory of the ball is curved, and the earth is round, then do you think it would be possible to throw a ball all the way around the earth?

How high and how fast do you think the ball would need to go?

Draw the Path of a Ball Falling Around the Earth. This is Called _____



Draw the Path of the Ball Through the Air. This path is called a Trajectory



If the Trajectory of the ball is curved, and the earth is round, then do you think it would be possible to throw a ball all the way around the earth?

Answers will vary, but yes, it is possible

How high and how fast do you think the ball would need to go?

Answers will vary.

The minimum speed and altitude needed to reach orbit depends on the object's mass but is about 17,000 mph at 700,000 feet.

Draw the Path of a Ball Falling Around the Earth. This is Called Orbit

