

OBJECTIVES

Children will:

- Explore motion and stability and how they interconnect with magnetic and gravitational forces.
- Brainstorm and test ways to generate the motion of steel discs.
- Research—then write a letter to a physicist to explain—tension, force, and nuclear force.

BACKGROUND KNOWLEDGE

Review and demonstrate force, motion, stability, friction, gravity, and gravitational forces.

Motion is the action of moving or being moved. *Stability* describes how an object or substance can remain unchanged for a period of time. To demonstrate, place an object on a table. Have the class explain what happens when you put the object there. Gently push the object. Have children explain what happens when force is applied to the object. (The object's motion is determined by the forces that act on it. If force is applied to an object, its motion can change.) Also review *friction* (force exerted by a surface as an object comes in contact with, or moves across, the surface).

Gravity is the force that causes objects with mass or energy to be attracted toward Earth. The force that coincides with gravity is called *gravitational force* (force that exists between any two objects that have mass). Ask children why astronauts “float” in space. Then, ask why we stay on the ground on Earth. (Earth's gravitational force is strong enough to hold us on Earth.)

Different forces have different strengths, so when forces interact with one another, one will be weaker, and one will be stronger. *Electromagnetic force* (the force of a magnetic field and electric current) is stronger than Earth's gravitational force. The force that exists between two charged particles is much greater than the force of gravity. Depending on the strength of the magnets involved, electromagnetic force can be stronger than friction too.

PRE-ASSEMBLY

If you have not assembled the station yet, do so before the experiment on the next page. See pages 6-7 for assembly instructions or visit DowlingMagnets.com/WW to download small-group experiment instructions that do not require the station.



KIDS EXPLORE IT!

DIFFERENTIATING INSTRUCTION

Below level: Demonstrate examples of the forces. Gravitational force: throw a ball up in the air and let it fall to the ground. Magnetic force and friction: place a magnet on a steel base plate and drag the magnet. Discuss what happened in each demonstration.

Above level: Have children research another force (such as tension force or nuclear force) and write a letter to a physicist that summarizes each force, provides examples, and explains which force is their favorite and why.

MATERIALS

- Station
- Clear viewing tray
- 1 Red/Blue magnet wire (6mm)
- 1 Red/Blue magnet wire (8mm)
- 1 Steel disc weight
- Marker (water-based)

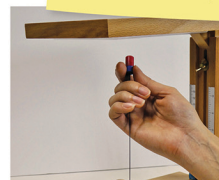
EXPLORE IT



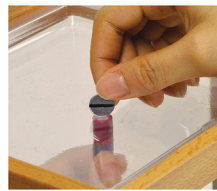
1. Place a viewing tray in the top of the station. Remove and set aside the steel base plate from the bottom part of the station.



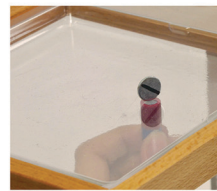
2. Using a marker, draw a line across the diameter of one steel disc. Allow the marked disc to dry.



3. Hold a red/blue magnet wire (6mm) under the viewing tray, directly touching the underside surface of the tray.



4. Directly over the magnet, hold the marked disc (inside the tray), so the disc stands vertically on its edge while being attracted to the magnet.



5. Move the magnet under the tray to make the disc roll.



6. Repeat steps 3-5 using an 8mm red/blue magnet wire instead of a 6mm one.

ANALYZE & INTERPRET

- Why did the disc stay vertical as you moved the magnet? Why did the disc roll?

- Describe the differences in your experiences in using the 6mm vs. the 8mm magnet wire.

- What happens when you try to slide the disc on its side instead of on its edge?
