Connecting

## Frictional Force

**1.** Collect an eraser, tape, a piece of carpet and a piece of paper.

Experiment

Tape the piece of carpet onto the table. Place the eraser on top and push it with your hand.

Tape the piece eraser on top a

**a.** In which situation is it more difficult to move the eraser? Why do you think that is?

When pushing the eraser over both surfaces, you can feel that it is easier to move the eraser on paper than on carpet.

When two bodies are in contact, in this case the eraser and the surface (carpet or paper), the **interaction** between the two is called **friction** or **frictional force**. The strength of this interaction depends on the characteristics of the surfaces that are touching. Some surfaces are **porous**, like the carpet, and others are smooth, like the paper. The force of friction **opposes the motion of objects**.

In the experiment you just completed, the frictional force was stronger when you pushed the eraser on the carpet because it is more porous than the paper.

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## Gravitational Force

gently

1. Hold an object in your hand. Softly toss it into the air. What happens?
Describe

Look at these photographs.

As you can see, the cube reaches a certain height and then falls back into the person's hand. This is because our planet has a force that attracts objects to its surface. It is called the **force of gravity** or **gravitational force**. It is a noncontact or distance force.

The amount of gravity that earth exerts on a body depends on the body's mass. For example, if we compare the gravitational force that earth exerts on a car with the gravitational force it exerts on an ant, the force of gravity on the car is stronger. This is because the car has a greater mass than the ant. The **weight** of an object is the force exerted on it by gravity.

Sometimes we use the words **weight** and **mass** as synonyms. However, the concepts are different. Mass is the amount of matter in a body. Weight is the measurement of how strongly the force of gravity is pulling on a body.

### Fun Fact!

The force of gravity is not only felt on earth. Its effects can be felt on other planets and celestial bodies, like the moon. There is also a force that attracts the moon to earth, and one that attracts the planets in the solar system to the sun. The force keeps them constantly in orbit.

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## Magnetic Force

1. Collect a magnet and a few paper clips. Move the magnet toward the clips. What happens? Describe

The force that attracts the paper clips to the magnet is called **magnetic force**. It is a noncontact force.

Magnetic force can **attract** or **repel**. In the case of the paper clips and the magnet, the force at work is attraction.

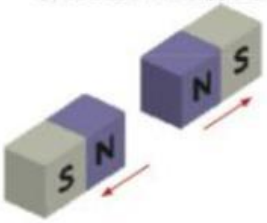
2. Find two magnets with the poles marked north and south. Complete the following activities. Experiment

Each magnet has two sides or **poles** with opposing characteristics. One is north (positive) and one is south (negative).

### Challenge

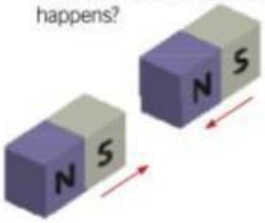
Why are the ends of earth called the North and South Poles? How does a compass work? Draw a picture to answer these questions.

**a.** Move the north side of one magnet toward the north side of the other. What happens?



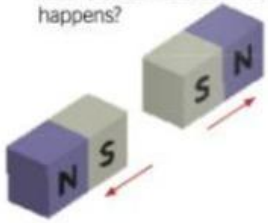

The magnetic force in this case is **repulsion** because the magnets do not come together.

**b.** Next, move the north pole of one magnet toward the south pole of the other. What happens?




In this case, the magnetic force is **attraction** because the magnets come together.

**c.** Finally, move the south pole of one magnet toward the south pole of the other. What happens?




The magnetic force in this case is **repulsion** because the magnets do not come together.

## Electric Force

sheep hair

Have you ever taken off a wool sweater and noticed it made your hair stand up? Or have you felt a little **shock** when you touched another person? These situations are caused by **electric force**. Electric force corresponds to the interaction between bodies that have an **electric charge**.

Is there interaction between bodies with electric charges? Just like magnetic force, electric force can also establish connections between bodies.

When charged bodies are moved toward each other, their interaction depends on the electric charge of each one. Some interactions are:

Two bodies with a negative electric charge repel each other, so the electrical force between them is **repulsion**.

Two bodies with a positive electric charge repel each other, so the electrical force between them is **repulsion**.

One body with a negative electric charge and another with a positive electric charge attract each other, so the electrical force between them is **attraction**.

### Word Focus

An **electric charge** is a characteristic that some bodies develop through interactions such as rubbing against another body. Objects that have an electric charge interact with each other. There are positive and negative charges.

moving against with pressure

A positive charge is represented with a + symbol and a negative charge with a – symbol.

### Did You Know...?

**Static** electricity is what makes your hair stand on end after you go down a slide or rub a balloon on your head. It happens when the electric charge on the surface of one object is transferred to another object that has less charge.

### Fun Fact!