ACTIVITY 25

Magnets Push and Pull

BROWARD COUNTY ELEMENTARY SCIENCE BENCHMARK PLAN

Grade 1—Quarter 3
Activity 25

SC.B.2.1.1
The student recognizes systems of matter and energy

SC.C.1.1.2
The student knows that there is a relationship between force and motion.

SC.H.1.1.1
The student knows that in order to learn, it is important to observe the same things often and compare them.

SC.H.1.1.2
The student knows that when tests are repeated under the same conditions, similar results are usually obtained.

SC.H.1.1.3
The student knows that in doing science, it is often helpful to work with a team and to share findings with others.

SC.H.2.1.1
The student knows that most natural events occur in patterns.

ACTIVITY ASSESSMENT OPPORTUNITIES

The following suggestions are intended to help identify major concepts covered in the activity that may need extra reinforcement. The goal is to provide opportunities to assess student progress without creating the need for a separate, formal assessment session (or activity) for each of the 40 hands-on activities at this grade level.

1. Tie one end of a 30-cm (1-ft) length of thread or lightweight string to a paper clip, and tape the other end to a desk. Hold the pole of a bar magnet close enough to the paper clip to attract it without touching it, then slowly raise the magnet so the paper clip hovers in the air at the end of the string/thread. Ask, *Why does the magnet raise the paper clip?* (The paper clip is made of metal, so it is attracted to the magnet. The magnet pulls on the paper clip.) *Why does the paper clip stay up in the air without moving?* (The string is pulling the paper clip in the opposite direction, so the paper clip stays still.)

2. Use the Activity Sheet(s) to assess student understanding of the major concepts in the activity.

In addition to the above assessment suggestions, the questions in bold and tasks that students perform throughout the activity provide opportunities to identify areas that may require additional review before proceeding further with the activity.

ACTIVITY 25

Magnets Push and Pull

OBJECTIVES

Students discover that magnets exert both a push and a pull. They also find that the poles of a magnet exert the strongest force.

The students

- identify the poles on a bar magnet
- observe that like poles repel each other and unlike poles attract each other
- locate the parts of a magnet that exert the strongest force

SCHEDULE

About 50 minutes

VOCABULARY

attract
magnet
pole
repel

MATERIALS

For each student

1	Activity Sheet 25

For each team of four

2	magnets, bar, with poles labeled
10	paper clips, small

For the class

1	candle, birthday
1	paper clip, large
1	rubber band
1	washer, small
	Delta Science Reader, *Properties*

*provided by the teacher

PREPARATION

1. Make a copy of Activity Sheet 25 for each student.

BACKGROUND INFORMATION

Magnetism is a force that causes some things to move towards each other and other things to move away from each other. The space around a magnet is called its ***magnetic field***. When an object containing iron is inside a magnetic field, the magnetic force that the field exerts makes the object move.

The force is not equal in all parts of a magnet's magnetic field. The magnetic field is strongest at the ends, or poles, of a magnet and weakest in the area midway between the poles. One pole is called the north-seeking, or north, pole. The other end of the magnet is called the south-seeking, or south, pole.

The shape of a magnetic field changes when two magnets interact. When two like poles (N-N or S-S) come near each other, they repel each other. This repulsion is a pushing force. Unlike poles (N-S or S-N) attract each other. This attraction is a pulling force.

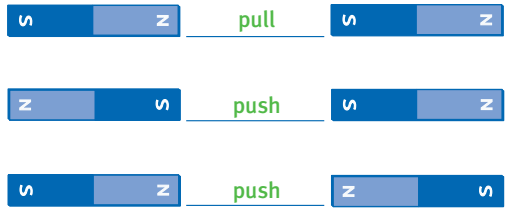
Magnets are important in modern life. They are used to produce large amounts of electricity in power stations. Large industrial electromagnets move heavy iron and steel

objects. Magnets are important diagnostic tools in medicine. There are magnets in electric motors, refrigerator doors, loudspeakers, computers, cassette recorders, and many other devices. Even our paper money is magnetic. (See the Science, Technology, and Society connection on page 285.)

▼ **Activity Sheet 25**

Magnets Push and Pull

1. Look at each pair of magnets. Write *push* or *pull* on the line between the magnets to show the force between them.



2. How many paper clips could you hang at the north pole?
Answers will vary.

3. How many paper clips could you hang at the south pole?
Answers will vary.

4. How many paper clips could you hang in the middle?
Answers will vary.

Guiding the Activity

Additional Information

1 Hold up a bar magnet. Ask, **Does anyone know what this is?**

Most students will recognize it as a magnet.

Write the word *magnet* on the board. Remind students that a **magnet** is an object that has the property of attracting iron or metals containing iron. Ask, **Do you remember what kinds of things stuck to the magnet you studied earlier?**

Students may remember that in Activity 5, paper clips, steel strips, and washers stuck to the magnets.

As a quick review of Activity 5, show students the candle, paper clip, rubber band, and metal washer. Ask if each object will stick to the magnet, then demonstrate.

The paper clip and metal washer will stick to the magnet; the candle and rubber band will not.

2 Tell students that they are going to learn more about magnets. Arrange them into teams of four. Distribute two magnets to each team. Give students a few minutes to explore freely with their magnets, then ask, **What do the *N* and *S* on the magnets stand for?**

Many students will know that N *stands for north and* S *stands for south.*

Guiding the Activity

Additional Information

Explain that the ends of a magnet are called its **poles**. All magnets have a north pole and a south pole, just as Earth has a North Pole and a South Pole. The north pole of a magnet is marked *N* and the south pole is marked *S*.

3 Tell students that magnets produce forces, and ask, **What is a force?**

Students should recall that a force is a push or a pull.

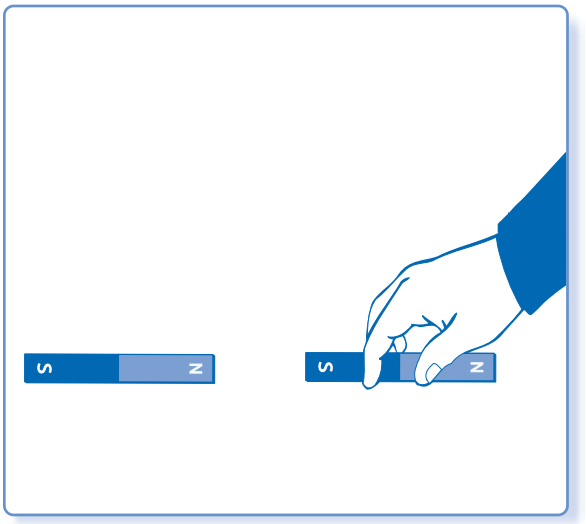
Tell students that the north and south poles are different, although they look alike. Ask students what they think will happen if they bring the south pole of one magnet close to the north pole of another magnet.

Accept all answers.

4 Have students place one magnet on the left side of the desk with its north pole at the right. Tell them to position the second magnet with its south pole on the left and then slide it slowly across the desk until it is close to the north pole of the first magnet (see Figure 25-1). Have each student on the team take a turn doing this. Ask, **What did you feel? What did you see?**

Students should have felt a strong pull between the magnets' poles as they got closer. When they got very close, the two magnets jumped together.

Explain that a north pole and a south pole are *different* poles. Different poles pull on each other. When magnets pull on each other, we say they **attract** each other.



▲ ***Figure 25-1.*** *The south pole of the magnet on the right is coming close to the north pole of the magnet on the left.*

Guiding the Activity

Guiding the Activity	Additional Information
5 Distribute a copy of **Activity Sheet 25** to each student. Tell students to write *push* or *pull* on the line between the two magnets in picture A to identify the force between them.	
6 Ask students what they think will happen if they bring the south pole of one magnet close to the south pole of the other magnet.	*Accept all answers.*
Have students place one magnet on the left side of the desk with its south pole at the right. Tell them to position the second magnet with its south pole on the left, then slowly slide it across the desk until it is close to the south pole of the first magnet. Have the students in each group take turns doing this. Ask, **What did you feel? What did you see?**	*Students should have felt a strong push between the magnets' poles as they got close. When they got very close, they pushed each other apart.*
Explain that a south pole and a south pole are the same poles. Two poles that are the same push on each other. When magnets push on each other, we say they **repel** each other.	
7 Have students write *push* or *pull* on the line between the two magnets in picture B to identify the force between them.	
8 Have students repeat step 6 with north poles together. Explain that two north poles are the *same* poles and that they repel each other just as two south poles do. Have students write *push* or *pull* on the line between the two magnets in picture C to show the force between them.	
9 Ask, **Do you think the force of a magnet is the same in all parts of the magnet?**	*Accept all answers.*
Ask, **How can you use the magnet and some paper clips to find out?**	*Accept all answers. If necessary, suggest that students can compare how many paper clips are picked up by the magnet's poles and by the area between the poles.*

Guiding the Activity

Distribute 10 paper clips to each team. Instruct students to hold the magnet horizontally with one hand and stick one paper clip on the underside of the magnet's north pole. Then tell them to try to stick a second paper clip carefully onto the dangling end of the first paper clip. When students have done this, explain that the second paper clip sticks to the first one because the magnet's pulling force can travel through paper clips (see Figure 25-2).

Have students continue to add paper clips to the chain until no more are attracted to the chain. Have them count the number of paper clips in the chain and record the number in question 2 on the activity sheet. Then have students remove the paper clips from the magnet.

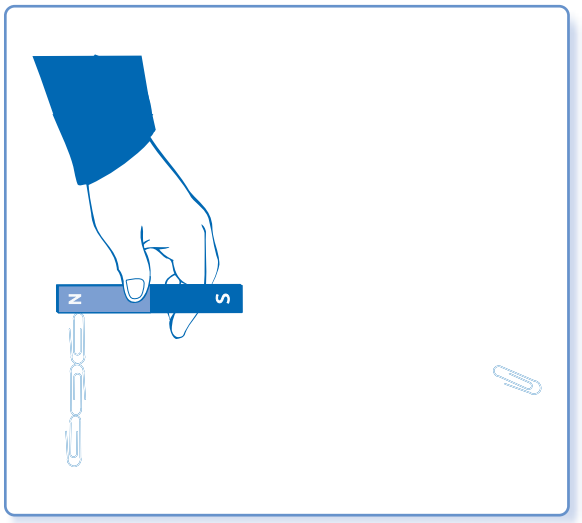
10 Have students repeat the process by sticking a paper clip to the magnet's south pole and making a chain as before. Have them count the number of paper clips in this chain and record the number in question 3 on the activity sheet, then remove the paper clips again.

11 Have students repeat the process by sticking a paper clip to the middle of the magnet and then making a chain as before. Have them count the number of paper clips in this chain and record the number on the activity sheet. Ask, **How did the number of paper clips in the three chains compare?**

Ask, **What does this tell you about how strong the force is at the poles and at the middle of a magnet?**

12 As appropriate, read or review page 8 of the Delta Science Reader *Properties*.

Additional Information



▲ ***Figure 25-2.*** *Paper clips can stick to each other because the magnetic force travels through the first paper clip and attracts the second one.*

Students should observe that the chains were the same length at the two poles and that these chains were both longer than the chain at the center of the magnet.

Students should recognize that the force is stronger at the poles than it is in the middle.

Reinforcement

If different shapes and sizes of magnets are available, have students repeat the experiment with paper clips to compare the strengths of the different magnets.

Science Journals

Have students place their completed activity sheets in their science journals.

Cleanup

Have students return the paper clips to the designated container and return the magnets to the kit.

Connections

Science Extension

- Have students rub an iron nail with one pole of a magnet, stroking in only one direction. Then let them find out whether they can pick up small metal objects with the magnetized nail. Explain that the nail has become a magnet. Have students rub the nail with additional strokes to see if it will pick up more objects. Students can also try to magnetize an object that is not attracted to the magnet.

- Have students test the magnetized nail to determine which end is the north pole and which end is the south pole. They can do this by trying to magnetize a second nail, using the other pole of the bar magnet, then testing to see how the second nail has become magnetized. Challenge students to predict what might happen to the polarity if the nail were stroked in the opposite direction while being magnetized and to test their prediction. Students can also predict and test what might happen if the magnet were rubbed back and forth along the nail.

Science and Health

Have students put one cup (250 mL) of iron-fortified cereal into a gallon-sized self-sealing plastic bag. Have them crush the cereal to a powder with their hands, a rolling pin, or a hammer. Pour a small amount of the crushed cereal onto a piece of white paper and spread it out. Hold a magnet under the paper and move it around. Students will see tiny black specks that are attracted to the magnet. Explain that these specks are tiny pieces of iron that have been added to the cereal to make it more nutritious.

Science, Technology, and Society

Have students dangle a dollar bill in one hand. Have them put a magnet close to the printing on the dollar bill, then close to an area with no printing. They will find that the printing on the dollar bill is attracted to the magnet. The ink used to print paper money in the United States is magnetic. Have students speculate why magnetic ink is used. (to prevent people from counterfeiting money) Have students test other denominations of U.S. money. If foreign currency is available, have students test that also.