SCIENCE:

GRADE 1–FORCE AND MOTION

Force and Motion

Magnets Push and Pull

TEKS

1 (6) Force, motion, and energy. The student knows that force, motion, and energy are related and are a part of everyday life.

(B) The student is expected to predict and describe how a magnet can be used to push and pull an object.

Content Objective

I can predict and describe how a magnet can push and pull an object.

Science

Science Process Skills

1 (2) Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations.

(B) The student is expected to plan and conduct simple descriptive investigations such as ways objects move.

(E) The student is expected to communicate observations and provide reasons for explanations using student-generated data from simple descriptive investigations.

1 (4) Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world.

(A)The student is expected to collect, record, and compare information using tools, including computers, hand lenses, primary balances, cups, bowls, magnets, collecting nets, notebooks, and safety goggles; timing devices, including clocks and timers; non-standard measuring items such as paper clips and clothespins; weather instruments such as classroom demonstration thermometers and wind socks; and materials to support observations of habitats of organisms such as aquariums and terrariums.

Mathematics

1 (7) Measurement. The student directly compares the attributes of length, area, weight/mass, capacity, and temperature. The student uses

comparative language to solve problems and answer questions. The student selects and uses nonstandard units to describe length.

(A) The student is expected to estimate and measure length using nonstandard units such as paper clips or sides of color tiles.

1 (12) Underlying processes and mathematical tools. The student communicates about Grade 1 mathematics using informal language.

(A) The student is expected to explain and record observations using objects, words, pictures, numbers, and technology.

English Language Arts and Reading

1 (14) Reading/comprehension of informational text/expository text. Students analyze, make inferences, and draw conclusions about expository text and provide evidence from text to support their understanding.

(B) Students are expected to identify important facts or details in text, heard or read.

1 (27) Listening and speaking/listening. Students use comprehension skills to listen attentively to others in formal and informal settings. Students continue to apply earlier standards with greater complexity.

(A) Students are expected to listen attentively to speakers and ask relevant questions to clarify information.

1 (28) Listening and speaking/speaking. Students speak clearly and to the point, using the conventions of language. Students continue to apply earlier standards with greater complexity. Students are expected to share information and ideas about the topic under discussion, speaking clearly at an appropriate pace, using the conventions of language.

1 (29) Listening and speaking/teamwork. Students work productively with others in teams. Students continue to apply earlier standards with greater complexity. Students are expected to follow agreed-upon rules for discussion, including listening to others, speaking when recognized, and making appropriate contributions.

Force and Motion

Figure 19.

Reading/comprehension skills. Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author's message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers.

(C) The student is expected to monitor and adjust comprehension (e.g., using background knowledge, creating sensory images, re-reading a portion aloud).

(D) The student is expected to make inferences about text and use textual evidence to support understanding.

(F) The student is expected to make connections to own experiences, to ideas in other texts, and to the larger community and discuss textual evidence.

English Language Proficiency Standards

1 (C) Cross-curricular second language acquisition/learning strategies. The student is expected to use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary.

2 (C) Cross-curricular second language acquisition/listening. The student is expected to learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions.

2 (D) Cross-curricular second language acquisition/listening. The student is expected to monitor understanding of spoken language during classroom instruction and interactions and seek clarification as needed.

3 (D) Cross-curricular second language acquisition/speaking. The student is expected to speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency.

Language Objective

I can speak using the words push *and* pull *to describe the movement of a magnet.*

Force and Motion

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELA content, thus supporting the active engagement of students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found throughout each lesson in sections titled "Differentiation Strategy."

Differentiation should

- focus on skills students did not understand and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
  - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
  - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
  - participating in more tangible experiences, such as experiments, investigations, and active exploration;
  - sorting academic vocabulary words into categories by common attributes—process words or science content vocabulary;
  - organizing brainstorming into semantic maps or creating graphic organizers;
  - discussing the meaning of a graphic organizer with a partner; and
  - creating a visual representation to demonstrate understanding.

See the handout in the Content Resources section that addresses instructional strategies.

Force and Motion

College and Career Readiness Standards

I.C1 Collaborative and safe working practices. Collaborate on joint projects.

I.E1 Effective communication of scientific information. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

Vocabulary Focus

attract	closer to
magnet	describe
object	farther from
pull	nearer to
push	predict
repel	

Prerequisite Knowledge

K (6)(B) The student is expected to explore interactions between magnets and various materials.

5E Lesson Summary

Engage
Students explore the push and pull of ring magnets on each other.

Explore
Students predict and describe how magnets push and pull each other.

Explain
Students explain the pushing and pulling forces of magnets.

Elaborate
Students explore and measure the push and pull of magnets.

Evaluate
Students illustrate the interactions between two bar magnets.

Force and Motion

Engage

Content Builder

Magnets have two poles on opposite sides of the magnet. One is called the south pole and one is called the north pole. Like poles repel each other and opposite poles are attracted to each other. For example, north poles repel each other. In the same way, south poles push away from each other. North and south poles are attracted to, or pull toward, each other. Students will be able to clearly notice these observations when they interact with the magnets.

Materials

For student groups

- 6–8 ring magnets
- 1 pencil, not sharpened
- 1 small ball of clay

Teacher Note

Students will be given the opportunity to explore how ring magnets interact. They will find that one side of each ring magnet will pull toward other ring magnets and the other side will push away from other ring magnets. The poles of ring magnets are on the flat sides and, in most cases, are not marked.

Teacher Instruction

- Pass a set of materials to each pair of students.
- Instruct each student to stack two ring magnets.
- Instruct students to explore how the ring magnets interact with each other. Encourage students to do the following:
  - Place one ring magnet on the table, hold another ring magnet above it, and make observations. Ask the following question: What would happen if you flipped one ring magnet over?
  - Place one ring magnet on the table, hold another ring magnet next to it, and make observations. Ask the following question: What would happen if you flipped one ring magnet over?
  - Place the ball of clay on the table and stick the pencil into the clay so that it stands on its own. Place the ring magnets onto the pencil one at a time. Ask the following question: What do you observe?
- Allow adequate time for student exploration.

Force and Motion

Facilitation Questions

- What kind of movements did you observe as you placed the magnets beside each other? As you stacked the magnets? *The magnets pushed away from each other and pulled toward each other.*
- Did the magnets always stick together? *No, the magnets did not always stick together; sometimes they pushed away from each other.*
- Did the magnets ever appear to float? *Yes, the magnets appeared to float when they were pushing away from each other.*

Force and Motion

Explore

Advance Preparation

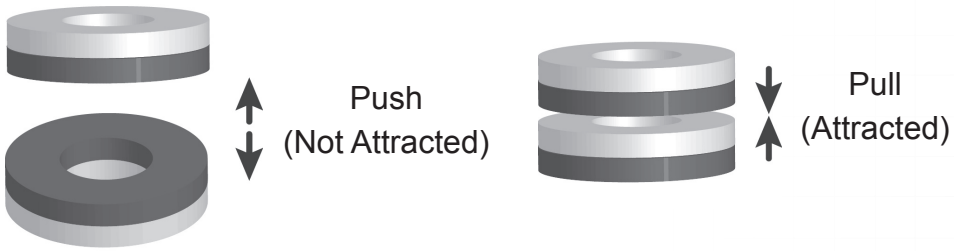
Use a flip chart to create a class science notebook.

Safety Alert

Keep magnets away from all computers and electronic equipment. Magnets can alter how some computer monitors or televisions display images. Magnets also can damage VHS tapes and credit cards.

Teacher Instruction

- Ask students to share their observations of the Engage activity.
- Model in the class science notebook how to record observations. Students should share that they felt pushing and pulling forces between the ring magnets, depending on which sides were facing each other. The recording may be an illustration that looks like this:



- Divide the class into groups of four students.
- Pass a set of materials to each group.
- Instruct students to first predict, explore, and then describe how the different magnets will interact with each other.

Materials

For teacher

- class science notebook

For student groups

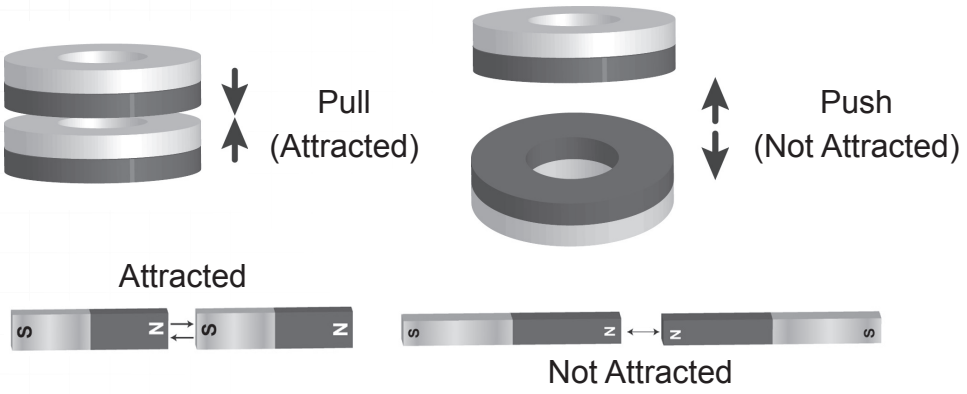
- Several types of magnets such as:
  - 2 bar magnets
  - 2 horseshoe magnets
  - 2 ring magnets
  - 4 magnetic marbles
  - 2 magnetic wands

For each student

- science notebook

Force and Motion

- Instruct students to first illustrate in their science notebooks their predictions, then test their predictions, and record what happens. Possible interactions include the following:



Facilitation Questions

- Did the behavior of the magnets surprise you? *Encourage students to share their observations and any predictions that were not correct. Answers will vary.*
- What did you observe when the ends of two bar magnets were pushed together? *The north poles pushed away from each other. The south poles pushed away from each other. The north and south poles pulled toward each other and stuck together.*
- What did you observe when two ring magnets were pushed together? *The ring magnets stuck together and pushed away from each other. The ring magnets sometimes pushed away, and one magnet flipped over if the magnets were stacked on top of each other.*
- What did you observe when two horseshoe magnets were pushed together? *Most likely, the horseshoe magnets stuck together. One of the only ways to get horseshoe magnets to push away is to push two magnets together, one on top of the other, facing the same direction.*
- Did you observe more movements when the magnets were near each other or farther apart? *The magnets moved more when they were near each other.*
- What observations can be made about the pull of magnets and their location to other magnets? *The pull of magnets is stronger when magnets are closer together.*

Explain

Teacher Instruction

- Read and discuss *Magician Nicki Reveals Magnetic Magic Tricks*.
- Ask students to demonstrate Nicki's tricks.

Facilitation Questions

- What caused the marbles to stick together? *The marbles are magnets. The magnetic marbles pulled toward each other and stuck together.*
- What caused the rings to separate or float? *The rings are magnets. The rings pushed away from each other when like sides (north or south poles) were placed together.*
- How did Nicki make her magic tricks work? *Nicki used magnetism to make her magic tricks work.*

Materials

For teacher

- *Magician Nicki Reveals Magnetic Magic Tricks* book
- bar magnets
- horseshoe magnets
- magnetic marbles
- ring magnets

Force and Motion

Elaborate

Materials

For student groups

- RM 1
- 2 bar magnets
- paper clip
- 2 ring magnets

Download Grade1_ Elaborate _F&M from Drop Boxes in your Science Academies for Grades K–4 Project Share group to use on a SMART™ or Mimio® interactive whiteboard.

Teacher Note

You may choose to have students work in groups of 2–3 or work independently to complete this activity.

Teacher Instruction

- Pass a set of materials to each group.
- Instruct students to use *RM 1: How Close Can It Get?* to guide their investigations by placing a bar magnet in the designated space in the center of page 1.
- Instruct students to predict how close the paper clip will be to the magnet before a push or a pull can be detected and to record their predictions on page 2.
- Instruct students to place the paper clip on the farthest line from the magnet.
- Instruct students to hold the bar magnet in place with one finger, then move the paper clip five spaces closer to the magnet, and then lift their hand away from the paper clip.
- Ask the following question: Did you notice a push or a pull when the paper clip was moved closer to the bar magnet?
- Instruct students to hold the magnet in place with one finger and to move the paper clip closer to the bar magnet one space at a time. Remind students to release, or lift their finger from, the paper clip to make observations each time they move it.
- Ask the following question: Did you notice a push or a pull as you moved the paper clip closer to the bar magnet?
- Instruct students to repeat each investigation and record the results three times.
- Instruct students to follow the same procedure using a ring magnet in place of the bar magnet.
- Allow adequate time for students to explore the interactions between the paper clip and the different magnets.

- Instruct students to repeat the procedure using two bar magnets, two ring magnets, and a ring and a bar magnet to complete page 3.
- Instruct students to predict how close magnets will be to each other before a push or a pull can be detected and to record their predictions on page 3 of *RM 1*.

Facilitation Questions

- What happened as you moved the paper clip from 10 spaces away to five spaces away? *Nothing happened when the paper clip was moved from 10 to five spaces away.*
- What did you observe as you moved the paper clip closer to the magnet? *We could feel and see the pull of the magnet on the paper clip as the paper clip was moved closer to the magnet. The pull of the magnet was stronger as the paper clip was moved closer to the magnet.*
- At what distance did the paper clip move? *Answers will vary depending on the magnets used.*
- What did you observe when the magnet and paper clip were farther apart? *We could not feel the pull of the magnet on the paper clip when they were farther apart.*
- What did you observe when the magnets were near each other? Did the magnets push or pull when they were near each other? *When the north and south poles of the magnets were near each other, they pulled toward each other. When two north or two south poles were near each other, the magnets pushed away from each other.*
- What did you observe when you moved the magnets closer together? *We could observe the push or pull between the two magnets as they were moved closer together.*

Force and Motion

Evaluate

Materials

For each student

- magnet
- magnetic object
- science notebook

Differentiation Strategies

Allow students to provide a verbal description while modeling the interactions with actual objects.

G/T: Ask students to create a video showing and describing the interactions or to illustrate and describe the interactions without the aid of magnets and other objects.

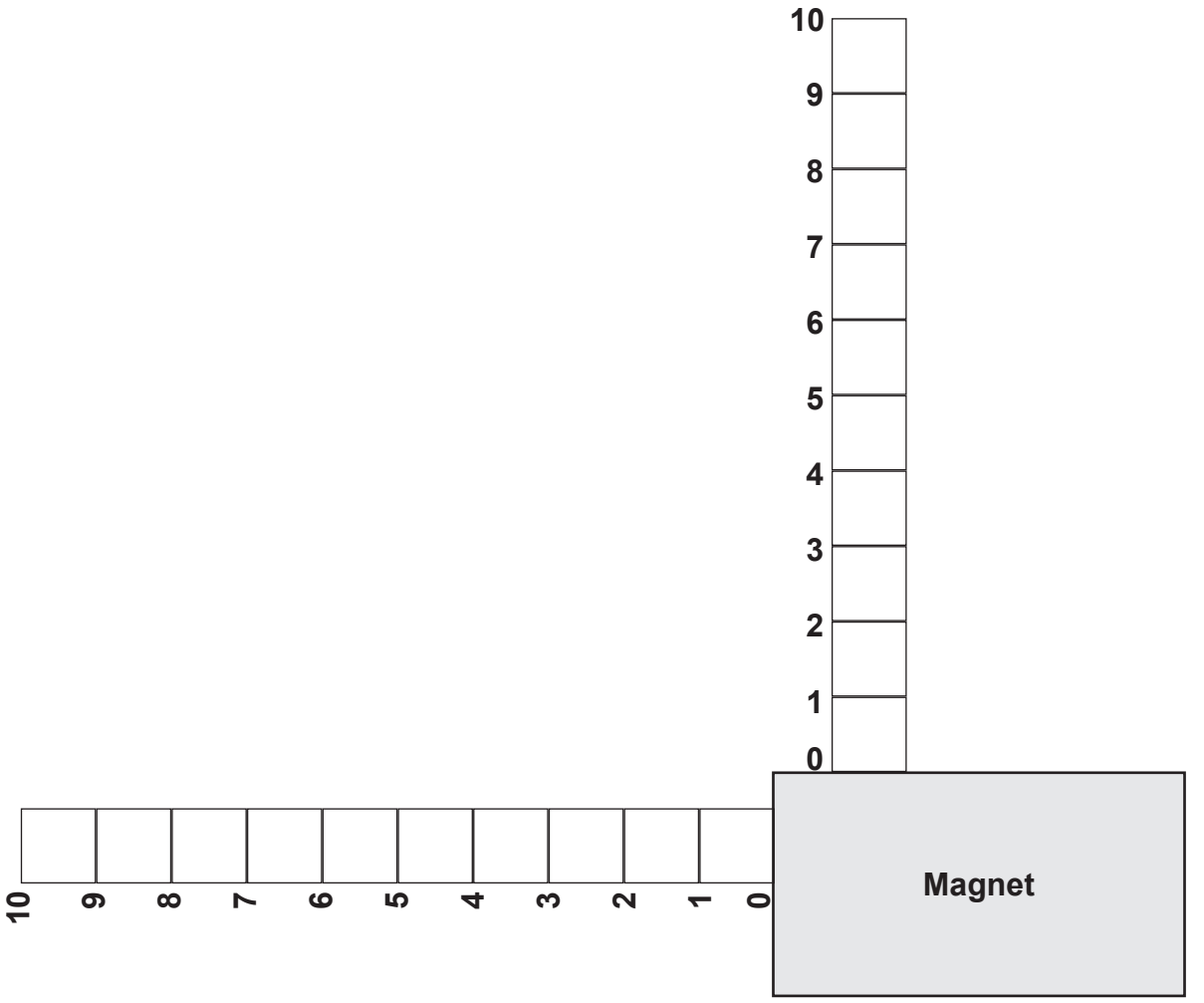
Teacher Instruction

- Instruct students to describe and illustrate in their science notebooks how a magnet and a magnetic object interact with each other.
- Students should be able to show, describe, and record how a magnet can push or pull an object.

Use a video-enabled device for students to create a vodcast (video podcast) demonstrating their understanding.

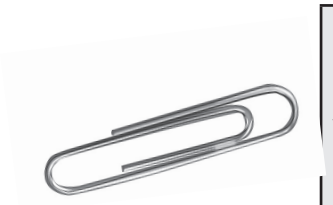
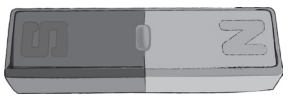
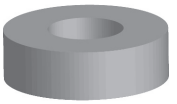
Grade 1

RM 1: How Close Can It Get?



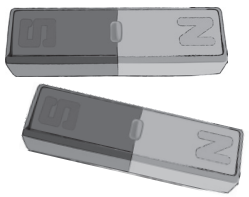
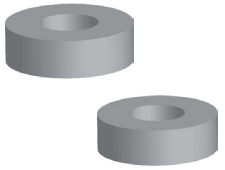
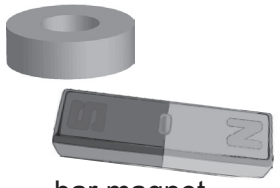
RM 1: How Close Can It Get? continued

Paper Clip to Magnet

	**Predict** **At which space will a push or a pull be observed?**	**Test** **At which space was a push or a pull observed?**			**Describe** **Record your observations.**
 bar magnet		1	2	3	
 ring magnet		1	2	3	

RM 1: How Close Can It Get? continued

Magnet to Magnet

	Predict At which space will a push or a pull be observed?	Test At which space was a push or a pull observed?			Describe Record your observations.
 bar magnets		1	2	3	
 ring magnets		1	2	3	
 bar magnet and ring magnet		1	2	3	

NOTES

NOTES