Magnets Discovery Circus

Intended for Second Grade

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CRIN E-06—November 2, 2010

Lesson Plan

Day: Monday, November 22, 2010
Topic: Force, Motion & Energy
Grade Level: 2
Subject: Magnets and Magnetism

NSES: Content Standard B
As a result of the activities in grades K-4, all students should develop an understanding of:

- Properties of objects and materials
- Position and motion of objects
- Light, heat, electricity, and **magnetism.**

SOLs:

Science 2.2 The student will investigate and understand that natural and artificial magnets have certain characteristics and attract specific types of metals. Key concepts include a) magnetism, iron, magnetic/nonmagnetic, poles, attract/repel; and b)important applications of magnetism including the magnetic compass.

Social Studies 2.1 The student will explain how the contributions of ancient China and Egypt have influenced the present world in terms of architecture, inventions, the calendar, and written language.

Social Studies 2.6 The student will demonstrate map skills by constructing simple maps, using title, map legend, and compass rose.

Daily Question: What is a magnet, and how does it work?

Procedures for Learning Experience	Guiding Questions	Materials Needed	**E**valuation (Assessment)	Approximate Time Needed
Engagement: Break class up into groups of 3 students (1 group of 4). In each group, designate a Group Monitor, Materials	What do you know about magnets? Do you use magnets in your life? Have	Paper, pencils, manila	Students written statements about magnets.	5-7 minutes

Manager, and Reporter. See Appendix for job descriptions. Give groups 3 minutes to write down something they know about magnets. Then, make a production of putting their writings into an envelope and sealing it. Tell them that at the end of the class, we will open the envelope and see how their ideas have changed.	you seen magnets used before?	envelope, mailing labels marked with job titles.		
Exploration: Every 6 minutes, students will rotate through the following activity stations (station cards attached): 1. Balancing Act • Students put ring magnets on a pencil with similar poles facing each other, which causes them to hover. 2. Magnetic Patterns • Students use magnets, iron filings, and a paper plate to observe lines of magnetism with one magnet and with two magnets. 3. Are All Metals Magnetic? • Students test a variety of metal objects to see if they will be attracted to a magnet, try to figure out a rule for what is and is not magnetic 4. The Biggest Magnet of All • Students investigate the workings of a compass and	See Activity Cards for guiding questions for each activity. General questions are: What is a magnet? How does it behave? What are some uses for magnets?	Pencils, Activity Books (attached), timer, ring magnets, ruler, bar magnets, iron filings, paper plate, 1 empty tin can, metal scissors, empty aluminum can, penny, dime, metal key, silver tray, metal fork, compass, 4 numbered signs on	Responses to questions in Activity Book, discussions students are having as they do each activity.	35 minutes

color a compass rose. 5. Are Magnets Medicine? • Students learn about ancient uses for magnets and how those ancient uses persist today.		classroom walls, crayons, poster on Ancient & Modern Uses of Magnets (photos attached).		
Explanation: As a class we will discuss the results of each activity, with each group's Reporter speaking for the group. Then we will open up the envelope and read their statements about magnets and revise them using what they have learned during the circus.	What were the results at each station as indicated in their Activity Books? What theories do students have about magnets now?	Activity Books, envelope from beginning of class.	Students reactions to their initial statements, revisions they suggest.	10 minutes
Extension: Give each student a magnetic letter to take home. Ask each student to explore their home and fill out the Magnetism Take-Home Chart, showing what it attracts and what it does not.	What surfaces in your home are magnetic? What objects are magnetic?	Alphabet magnet set, Activity Books.	Chart in Activity Book	5 minutes

Notes: Students will be divided into heterogeneous groups so that each group has at least one student who is comfortable writing answers and at least one student who will be willing to speak for the group as the Reporter. Teachers will pass out stickers (made from mailing labels) to each student indicating their job.

Jobs (each student will be given a mailing label with their job on it):

- Group Monitor—this student will be responsible for ensuring that the group works together and each student has a chance to use the materials.

- Materials Manager—this student will be responsible for making sure that the materials stay neat and are reset the way they found them at the end of each activity.
- Reporter—This student will communicate the group's results and conclusions to the class during the discussion.

Safety: Students should be told verbally not to touch or eat the iron filings. This information is on the activity card, but should be reinforced by the teacher also.

Student Card

Activity #1: Balancing Act

Directions:

1. Hold the pencil vertically with the eraser end resting on a flat surface. One at a time, slide the ring magnets onto the pencil, as shown in the picture.

2. If any magnet attracts, or sticks to, another magnet, remove it, turn it over, and place it back onto the pencil.

3. Using the ruler, measure the distance between each of the magnets.

4. Answer the questions in you Activity Book for Activity #1

CHALLENGE!

If you finish early, try putting two magnets together on the pencil and make a third magnet float. Is the distance between the magnets bigger or smaller than when you tried it with single magnets?

Teacher Information Card

Activity #1

Title: Balancing Act

Topic: Attraction and Repulsion

Grade Level: 2nd

Standards: 2.2 The student will investigate and understand that natural and artificial magnets have certain characteristics and attract specific types of metals. Key concepts include a) magnetism, iron, magnetic/nonmagnetic, poles, attract/repel; and b) important applications of magnetism including the magnetic compass.

Explanation of Concepts:

The magnets will hover in the air along the pencil because like poles will be facing each other. The force of like poles repelling each other will overcome the force of gravity, which would otherwise cause the magnets to simply stack on top of each other (which *will* occur if there are opposite poles facing each other).

Assuming the strength of each magnet is the same, the distance between each magnet should be uniform because each is exerting the same amount of force on the adjacent magnet.

For the Challenge! portion, the distance between the 2 magnets and the single floating magnet should be greater than when using single magnets because the doubled magnets exert more repelling force.

Materials: Pencil, 4-5 strong ring magnets, ruler.

Discussion Questions:
Why did flipping over the magnets that were attracted make them repel each other?

What was making the magnets hover?

Adapted From:
Prior, Jennifer O. (1999). *Thematic unit: magnets,* p.19. Westminster, CA: Teacher Created Materials Inc.

Student Card

Activity #2: Magnetic Patterns

Directions:

1. Put one magnet on the desk.
2. Put a paper plate on top of the magnet.
3. Carefully and slowly pour the contents of the cup onto the whole plate. DO NOT TOUCH THE FILINGS.
    a. Observe where the filings went. Is there a pattern? Draw a picture of the plate with the filings on it in the space on your Activity Book for this station.
4. Curl the plate into a funnel and pour the filings back into the cup.
5. Repeat the process using two magnets under the plate, with the red ends facing each other.
    a. What does it look like now? Draw a picture of the plate in the other circle in your Activity Book.
6. Talk about what changes you observed when you added the second magnet.

Teacher Information Card

Activity #2

Title: Magnetic Patterns

Topic: Magnetic Fields

Grade Level: 2nd

Standards: 2.2 The student will investigate and understand that natural and artificial magnets have certain characteristics and attract specific types of metals. Key concepts include **a) magnetism, iron**, magnetic/nonmagnetic, **poles**, attract/repel; and b) important applications of magnetism including the magnetic compass.

Explanation of Concepts:

The iron filings will be attracted to the magnet(s) under the plate in patterns reflecting the shape of the magnetic field(s). The filings will arrange themselves around the magnet(s) showing lines of magnetism.

Materials: 2 bar magnets, paper plates, paper cup with 2 tablespoons of iron filings.

Discussion Questions:
What happened to the filings when they were poured on the plate? Why?
When you used two magnets, what changed? Do you think the patterns would look different if you turned one of the magnets around?

Adapted from:
Bosak, Susan V. (2000). *Science is…* (p. 160). Toronto: Scholastic Canada.

Safety Note: Students should be supervised when working with iron filings to ensure that they do not touch or eat the filings.

Student Card

Activity #3: Are All Metals Magnetic?

Directions:

1. Do you think that a magnet will attract anything that is metal? Circle your answer in the Activity Book for Activity #3.
2. Touch the magnet to each object one by one. Using the chart in your Activity Book, note whether it was attracted to the magnet or not by writing "yes" or "no" in the right hand column.
3. Answer the questions in your Activity Book for activity #3.

Teacher Information Card

Activity #3

Title: Are All Metals Magnetic?

Topic: Magnetic vs. Non-magnetic

Grade Level: 2nd

Standards: 2.2 The student will investigate and understand that natural and artificial magnets have certain characteristics and **attract specific types of metals**. Key concepts include a) magnetism, iron, magnetic/nonmagnetic, poles, attract/repel; and b) important applications of magnetism including the magnetic compass.

Explanation of Concepts:

Some metals have a structure that allows electrons to easily line up, forming or responding to a magnetic field. Iron is the most common of these metals. Other metals such as copper can be magnetized, but the magnetic field is temporary and weak. Metal objects that are made from alloys containing iron (or high concentrations of nickel or cobalt) are magnetic. Copper and aluminum are not naturally magnetic.

Pennies are made of copper-plated zinc (another non-magnetic metal). Dimes are made of approximately 92% copper and 8% nickel, which is not a high enough nickel concentration for dimes to be magnetic.

Soup cans (often erroneously called tin cans) are made of steel, an alloy made from iron and other metals. The soup can is magnetic because of its high iron concentration. By contrast, the soda can is made of aluminum, which means it is not magnetic.

Both the fork and the key are made from steel alloys that contain iron. Therefore, they are also magnetic.

Materials: 1 strong magnet, 1 soup can, 1 soda can, 1 penny, 1 dime, 1 metal fork, 1 metal key.

Discussion Questions:
Are all metals magnetic? What items did not stick to the magnet? Why do you think that is?

Source:
Prior, Jennifer O. (1999). *Thematic unit: magnets,* p.16. Westminster, CA: Teacher Created Materials Inc.

Student Card

Activity #4: The Biggest Magnet of All!

The Earth is a giant magnet! It has 2 "poles" like any other magnet. You can use a compass to find North, East, South, and West.

Directions:

1. Face number 1. Put the compass on the desk and wait for the needle to stop moving. Where is the needle pointing? Draw the compass needle on compass 1 in your Activity Book.
2. Turn the compass and face number 2. Now where is the needle pointing? Draw the compass needle on compass 2 in your Activity Book.
3. Turn the compass and face number 3. Now where is the needle pointing? Draw the compass needle on compass 3 in your Activity Book.
4. Turn the compass and face number 4. Now where is the needle pointing? Draw the compass needle on compass 4 in you Activity Book.
5. Can you think of a rule for how the needle on a compass acts? Write it in your Activity Book.
6. Color the compass rose beneath your rule.

Teacher Information Card

Activity #4

Title: The Biggest Magnet of All

Topic: Compasses

Grade Level: 2nd

Standard: 2.2 The student will investigate and understand that natural and artificial magnets have certain characteristics and attract specific types of metals. Key concepts include a) magnetism, iron, magnetic/nonmagnetic, poles, attract/repel; and b) important applications of magnetism including **the magnetic compass.**

History SOL 2.6: The student will demonstrate map skills by constructing simple maps using title, map legend, and compass rose.

Explanation of concepts:

The needle of the compass is magnetic. The Earth is a giant magnet whose north pole (not *the* North Pole!) attracts the south pole of the compass needle. Therefore, the needle of a compass will always point to magnetic north no matter which direction you turn.

However, compasses can be thrown off by large metal objects like desks or chairs as well as by strong magnets. You may need to take the group outside to perform this activity away from magnetic "distracters."

The compass roses on old maps served dual purposes: they indicated the cardinal directions and they were often works of art. The students should color the compass rose in a way that indicates understanding that it represents 4 cardinal directions and 4 semi-cardinal directions.

Materials: 1 compass, 4 numbered signs on classroom walls.

Discussion Questions:
Where does the needle point? Does it change? How can using a compass help you?

NOTE: you may need to take each group outside to test the compass if there is too much metal in the classroom to get a clear reading. DO NOT store compass and magnets together, as it can ruin the compass. Make sure students are not approaching the compass with strong magnets.

Student Card

Activity #5: Magnets in History and Today!

Magnets have been used to help people feel better for many years. Legend even says that Cleopatra slept on a magnetic bed to keep from looking older. The ancient Romans believed that magnets could cure baldness, and the ancient Greeks used magnets to reduce pain.

Many people still use magnets for medical reasons. Look at the poster for some examples of how magnets are used today. Do you know anyone who uses magnets today?

Directions: Please answer the questions in your Activity Book for Activity #5

Teacher Information Card

Activity #5

Title: Magnets in History & Today!

Topic: Historical uses of magnets

Grade Level: 2nd

Standards: 2.2 The student will investigate and understand that natural and artificial magnets have certain characteristics and attract specific types of metals. Key concepts include a) magnetism, iron, magnetic/nonmagnetic, poles, attract/repel; and b) important applications of magnetism including the magnetic compass.

Social Studies SOL 2.1 The student will explain how the **contributions of ancient China and Egypt have influenced the present world** in terms of architecture, **inventions**, the calendar, and written language.

Explanation of Concepts:

Magnets were used in ancient medicine by the Egyptians, Romans, and Chinese (among others). Cleopatra reputedly slept on a magnetic bed to prevent wrinkles, the Romans believed magnets could cure baldness, and traditional Chinese medicine incorporates many uses of magnets. Also, the ancient Chinese are often credited with inventing a rudimentary compass that they used to navigate through fog.

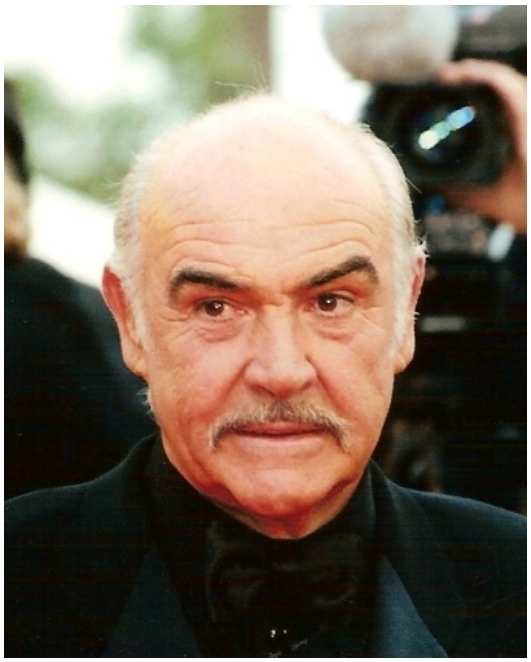
We still use magnets in many ways today, including in medicine (MRI or Magnetic Resonance Imaging), for holding things up on our refrigerators or file cabinets, for navigation, and in many appliances. Computer hard drives use magnets to read and write data.

Materials: Poster with pictures of baldness, Cleopatra, magnetic insoles, bracelets, knee braces, and MRI machine.

Discussion Questions:
What are some of the ways we use magnets in medicine today? Would you try magnets if you hurt somewhere? Why or why not?

NOTE: This is intended as a discussion of ancient uses and modern uses, not a critique of alternative medicine. Teachers should not express opinions as to whether magnets would be effective but rather talk about different beliefs and uses of them.

Appendix A: Images for Poster (Activity #5)



The ancient Romans believed magnets could cure baldness.

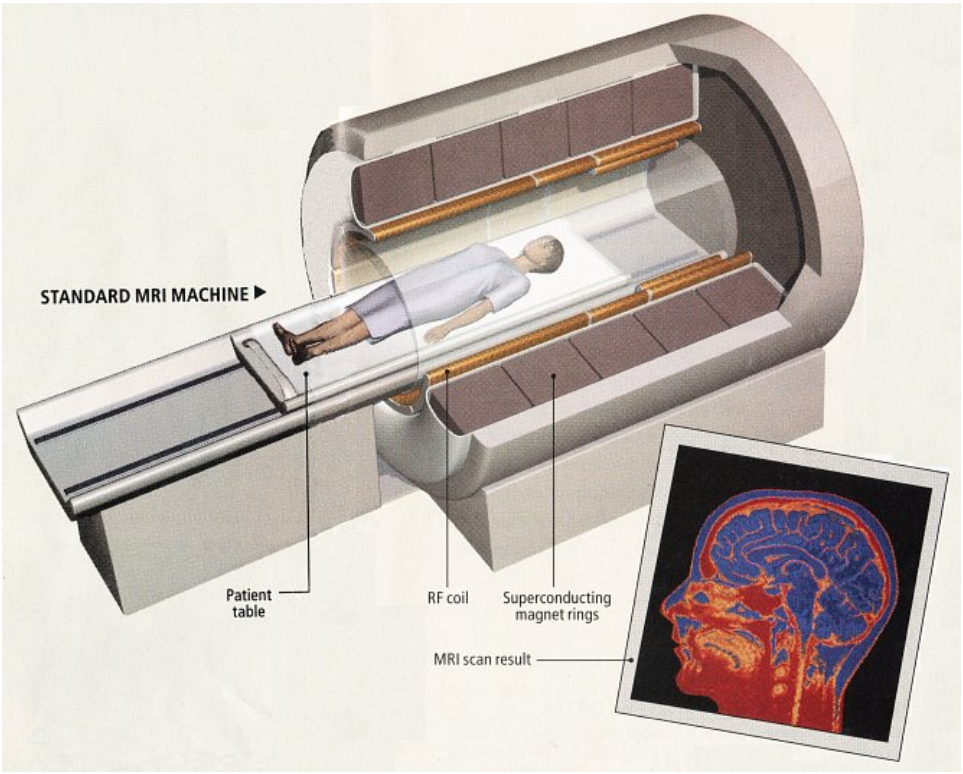
Legend says that Cleopatra slept on a magnetic bed to keep from getting wrinkles.

Many ancient cultures believed that magnets had healing powers.

Modern knee brace with magnets inside.

Copper bracelet with magnets, worn by many people to help with pain.

Computers use magnets to save and read information.



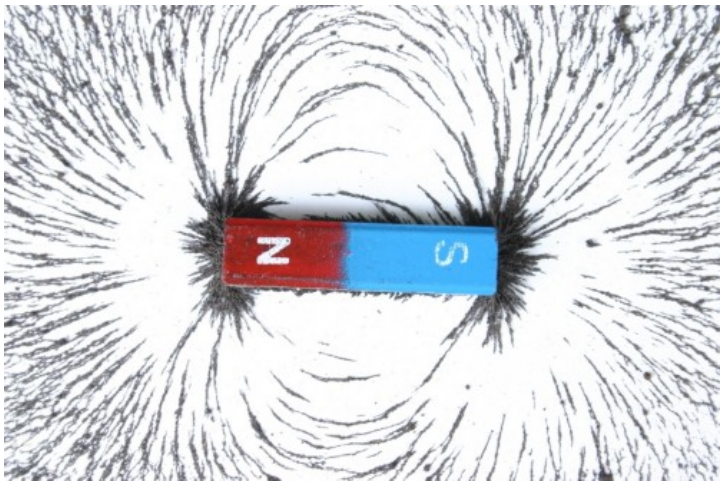
A Magnetic Resonance Imaging machine uses magnets to help doctors see inside you.

Appendix B: Activity Book

Second Grade

Magnets Discovery Circus

Student Activities Booklet



Name:

_____

Date:

_____

Mrs. Craft
Miss Weaver

Table of Contents

Activity #1: Balancing Act

Please answer the following questions:

1. What was the distance between each magnet?

2. Why do you think the magnets did not stick together while on the pencil?

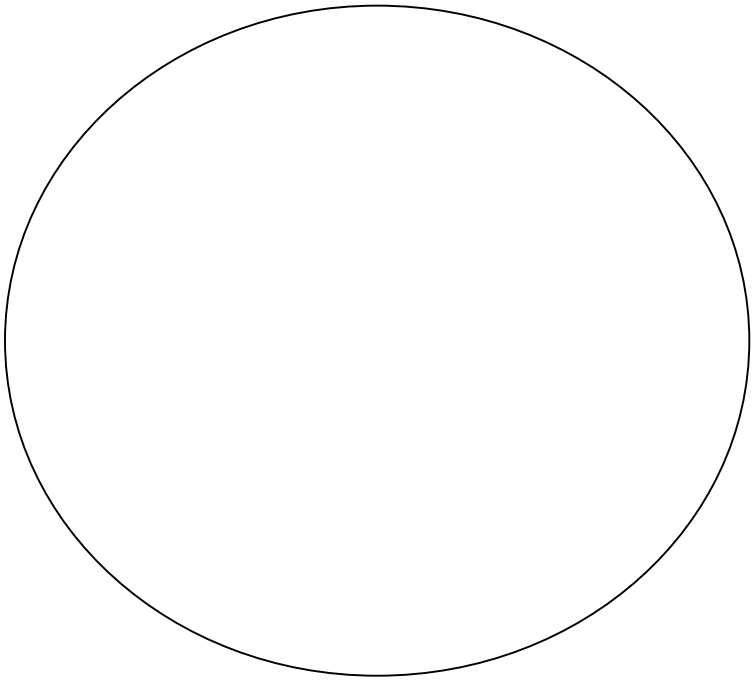
3. Why do you think there was space between each magnet?

CHALLENGE!

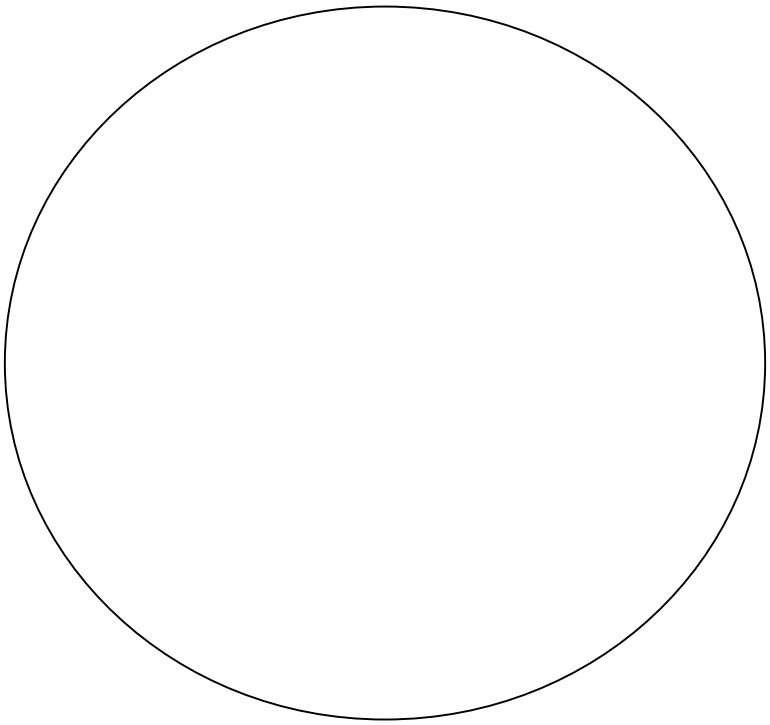
If you finish early, try putting two magnets together on the pencil and make a third magnet float. Is the distance between the magnets bigger or smaller than when you tried it with single magnets?

Activity #2: Magnetic Properties

1. Please draw what you saw after step 3. Is there are pattern?



2. Please draw what you saw after step 5.



Activity #3: Are all Metals Magnetic?

1. Do you think that a magnet will attract anything that is metal? Circle your answer.

Yes **No**

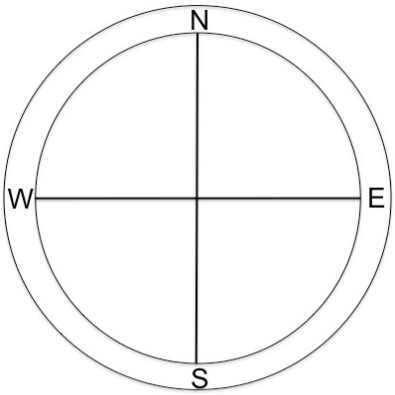
2. Fill in the chart below. If the metal attracted the magnet, write "yes." If the metal does not attract the magnet, write "no."

Object	Does it attract?
Penny	
Soup Can	
Dime	
Fork	
Soda Can	
Key	

3. Can you think of a rule for why some things attract and some do not? Are there any similarities among the objects that do attract? Similarities among those that do not?

Activity #4: The Biggest Magnet of All

1. Each time you turn to a number, record where the needle pointed.



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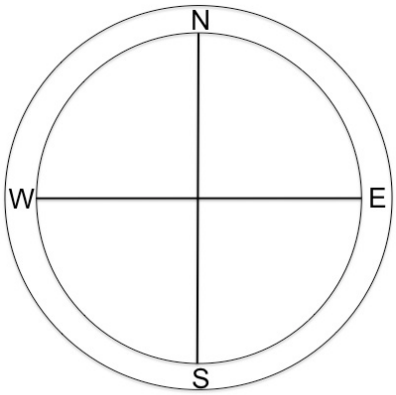

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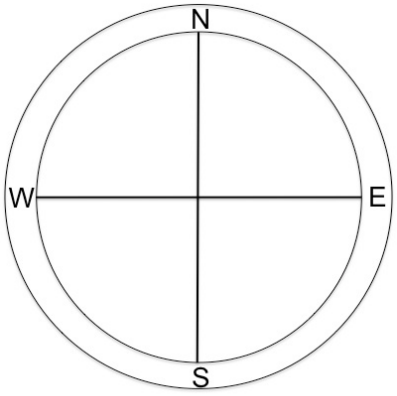

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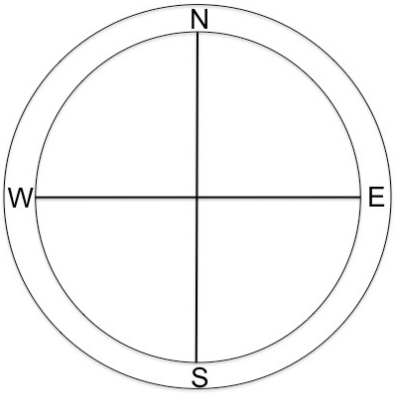

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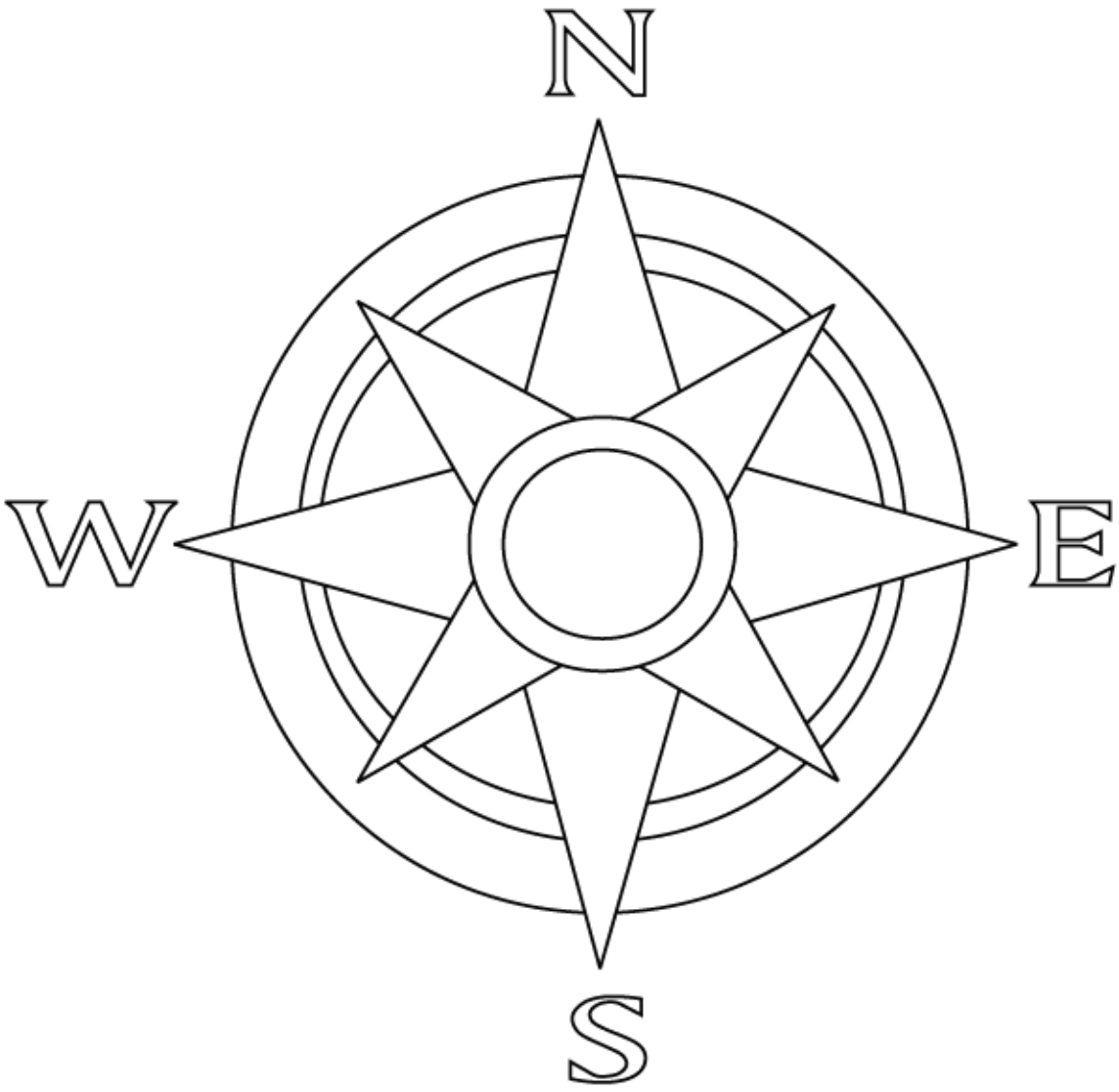
2. Can you think of a rule for how the needle of a compass acts?

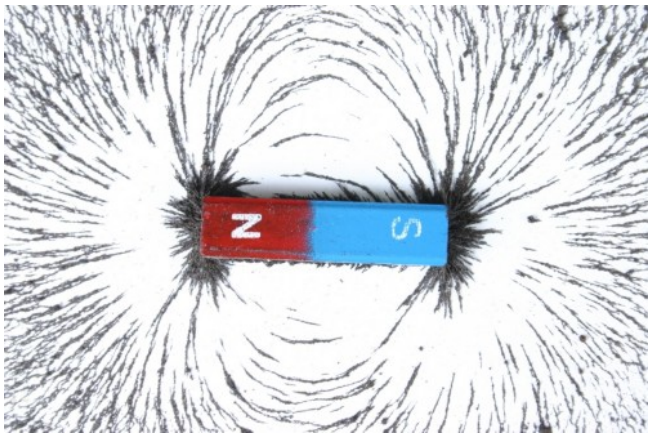


Activity #5: Magnets in History and Today!

1. Why do you think people believed that magnets could be used to heal them?

2. Can you think of any other uses for magnets?

Magnetism Take-Home Chart



Directions: Use the magnet you were given during the Magnet Activities to test objects around your home. Fill in the chart below, and report your findings to the class.

Object	Does it attract?