

Magnets - Fields of Force

Grade Level or Special Area: 2nd Grade, Science

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Length of Unit: Seven lessons (45 minutes each)

I. ABSTRACT

Second graders will become scientists and learn about the history and properties of magnets. They will participate in hands-on experiments, play games and work together to unlock the mystery of the world of magnets. Students will come away from this exciting unit with a true understanding of magnetic property and a love of scientific experimentation.

II. OVERVIEW

A. Concept Objectives

1. Students will realize the value of scientific investigation and how to evaluate investigations.
2. Students will understand that information can be gathered through observation and experimentation.
3. Students will recognize that there are forces in the world created by natural phenomenon that we can't see but which nonetheless have a real effect on objects that we can see.

B. Content from the *Core Knowledge Sequence*

1. 2nd Grade Science: Magnetism (pg. 60)
 - a. Magnetism demonstrates that there are forces we cannot see that act upon objects.
 - b. Most magnets contain iron.
 - c. Lodestones: naturally occurring magnets
 - d. Magnetic poles: north-seeking and south-seeking poles
 - e. Magnetic field (strongest at the poles)
 - f. Law of magnetic attraction: unlike poles attract, like poles repel
 - g. The earth behaves as if it were a huge magnet: north and south magnetic poles (near; but not the same as, geographic North Pole and South Pole)
 - h. Orienteering: use of a magnetized needle in a compass, which will always point to the north

C. Skill Objectives

1. Students will identify the properties of magnets. (2.2B CO State Standards)
2. Students will be able to differentiate between nonmagnetic and magnetic items.
3. Students will learn the history of magnets.

III. BACKGROUND KNOWLEDGE

A. For Teachers

1. *Experiment with Magnets and Electricity*, by Margaret Whalley
2. *What your Second Grader Needs to Know*, by E. D. Hirsch, Jr.
3. *Magnets, Pulling Together, Pushing Apart*, by Natalie M. Rosinsky

B. For Students

1. Students will have previous experience identifying what items are and are not magnetic.
2. Students will have previous experience locating north, south, east and west.
3. Understand that maps have keys or legends with symbols and their uses.

IV. RESOURCES

- A. Map of the World on transparency or wall map from enchantedlearning.com (Lesson Two)

V. LESSONS

Lesson One: Introduction to Magnets (45 minutes)

A. *Daily Objectives*

1. Concept Objective(s)
 - a. Students will understand that information can be gathered through observation and experimentation.
2. Lesson Content
 - a. Most magnets contain iron
 - b. Magnetism demonstrates that there are forces we cannot see that act upon objects.
3. Skill Objective(s)
 - a. Students will identify the properties of magnets.

B. *Materials*

1. One 6' x 3' sheet of white butcher paper
2. Three-four markers
3. Magnets – one per student
4. Household items:
 - a. Floppy disc
 - b. Compass
 - c. Refrigerator magnet
 - d. Radio
5. Six of each of the following:
 - a. Pennies
 - b. Erasers
 - c. Tooth picks
 - d. 2" square of aluminum foil
 - e. Nails
 - f. Metal keys
 - g. Paper clips
 - h. Bolts
 - i. Rubber bands
6. Appendix A (check list for items that are magnetic) – one for each group
7. Pencils – one for each group
8. Appendix B (chart to regroup into magnetic and non magnetic) – make a transparency or enlarge to chart size plus one for each student

C. *Key Vocabulary*

1. A *magnet* is a piece of metal that pulls other metal pieces to it.
2. *Magnetism* is a force that cannot be seen that pushes or pulls metal objects.
3. A *scientist* studies the world around him.
4. An *experiment* finds the answer to a question.
5. *Attract* is to pull.

D. *Procedures/Activities*

1. Before you begin the lesson, post Appendix B and post the 6' x 3' paper horizontally where everyone can see and write on it.
2. You will also need to set up centers for groups of students to work with enough magnets for each child to have his own. Place one of each of the following at

each center: penny, eraser, toothpick, aluminum foil, nail, key, paper clip, bolt, a rubber band, a pencil and one copy of Appendix A.

3. Have students come to the front of the chart paper so everyone can see it.
 4. Say to the students, *Today you are going to be scientists. Scientists do experiments to discover new things. You will get to discover magnets and all the things they can do. Does anyone know about magnets? Who would like to draw a picture or write something about magnets on this paper?*
 5. Have students raise their hand and allow two or three students at a time come and write or draw what they know about magnets.
 6. When everyone has had a chance to share, or as they are writing on the chart, discuss the information on the chart.
 7. Tell the students that magnets are found all over. Ask for any ideas of where magnets are found. List them on the chart paper. (If there is room in your classroom, keep up the chart paper until the end of the unit.)
 8. Show the students the floppy disc and say, *Magnets are found everywhere. This has a magnet in it.* (Show the students the compass) *This has a magnet in it.* Continue by showing the cassette tape, refrigerator magnet and radio and tell them they all have magnets
 9. Divide students into equal numbered groups. If there are only six of each item, you will want no more than six groups.
 10. Tell the students they will be experimenting with different objects and will try to discover which of these items are magnetic and which are not. Hold up each item and tell them what it is.
 11. Have the students record the results onto Appendix A.
 12. Discuss why some things were attracted and why others were not attracted to the magnet.
 13. Discuss with the students that magnets attract only iron, steel, cobalt and nickel.
 14. Quick questions to ask:
 - a. *Do you think a water bottle is magnetic? Why or why not?*
 - b. *Do you think a key is magnetic? Why or why not?*
 - c. *Name something magnetic in the classroom. Test it.*
 - d. *Why is that object magnetic? Why is it not?*
 15. Give each student a copy of Appendix B, scissors and glue. Do activity together.
 16. On the overhead cut out the pictures of the items. Tell the students to cut out the items on their paper.
 17. Hold up a picture and ask if it is magnetic or not magnetic.
 18. Have the students glue the picture onto the correct side of the chart.
 19. Continue until all the pictures have been sorted and glued onto the chart.
- E. *Assessment/Evaluation*
2. Use Appendix B to record the whole class results.
 3. Collect and check that the pictures have been glued under the correct heading.

Lesson Two: History of Magnets (45 minutes)

A. Daily Objectives

1. Concept Objective(s)
 - a. Students will understand that information can be gathered through observation and experimentation.
2. Lesson Content
 - a. Lodestones: naturally occurring magnets
 - b. Most magnets contain iron.

3. Skill Objective(s)
 - a. Students will be able to differentiate between nonmagnetic and magnetic items.
 - b. Students will learn the history of magnets.
- B. *Materials*
 1. Lodestone
 2. Map of the world on transparency or wall map from enchantinglearning.com (color in Greece and China with two different colors or mark where they are located)
 3. Appendix C (Background Notes) – one for the teacher
 4. Compasses – one for every two or three students
 5. Appendix D (rules and set up for the game) – one for the teacher
- C. *Key Vocabulary*
 1. *Lodestone* is a natural magnetic stone.
- D. *Procedures/Activities*
 1. Before you begin, download a copy of the world map from enchantinglearning.com.
 2. Begin by reviewing items that are magnetic.
 - a. *Can you tell me something that is magnetic?* (pencil sharpener, key)
 - b. *Why are they magnetic?* (It is metal.)
 - c. *Tell me something that is not magnetic.* (plastic water bottle)
 - d. *Explain why it is not magnetic.* (It is not made of steel.)
 3. Show on the world map where Greece is found.
 4. Tell the story of Magnes a Greek Shepard who discovered lodestone. (Use Background Notes on Appendix C.)
 5. Show them lodestone. Hold an iron nail close to it to show how it attracts it. Hold other metal items to it and show the magnetic properties.
 6. Pass around the stone for everyone to see and test the magnetic property.
 7. Show on the world map where China is found.
 8. Discuss how the Chinese used magnets as the first compass. (Use Background Notes.)
 9. Show them the compass. Pass out compasses to every two or three students to share.
 10. Ask the students: *Does anyone know what a compass is for?* (Find north, south, east, west) *Have any of you used a compass? Look at the compass. Where is the needle pointing? (N) What does the N stand for? (North) What happens if you turn around? (Have students turn around. The needle should stay pointing north.)*
 11. *Who can tell me what is inside the compass that makes it work?* (Magnet)
 12. Play *Find the Lodestone*, found in Appendix D.
 13. After the first game, have students sit and ask them these questions.
 - a. *Who found the first magnet in Greece?* (Magnes)
 - b. *What did the Chinese do with lodestones?* (Made compasses)
 - c. *What did the first compasses look like?* (Spoons)
 - d. *What do we call lodestone today?* (Magnetite)
- E. *Assessment/Evaluation*
 1. Students will be assessed on their ability to correctly answer the above questions at the end of the unit (Appendix I).

Lesson Three: Attract and Repel (45 minutes)

A. Daily Objectives

1. Concept Objective(s)
 - a. Students will realize the value of scientific investigation and evaluate investigations.
 - b. Students will understand that information can be gathered through observation and experimentation.
2. Lesson Content
 - a. Law of magnetic attraction: unlike poles attract, like poles repel
3. Skill Objective(s)
 - a. Students will identify the properties of magnets.

B. Materials

1. Magnets – one per student with different colored poles
2. Iron filings in a small container
3. 10 small Hot Wheels or Match Box cars or trucks
4. Tape
5. Appendix E (Graph of Attraction and Repelling of magnets)
6. Paper – one per student
7. Crayons – two different colors per student
8. Pencils – one per student

C. Key Vocabulary

1. *Repel* is to push away.
2. *Attract* is to pull.
3. The *Greeks* were a powerful civilization that live thousands of years ago.

D. Procedures/Activities

1. Before the lesson, write the words *repel* and *attract* on the board. Set up workstations for three or four students at each station. Put four magnets and iron filing at the station.
2. *When we started this unit, I told you we would be scientists. Today, though, we are going to be “magic” scientists. The Greeks believed lodestones held magical powers. Today we are going to find some of those powers.*
3. *Before we can start working with magic, we must learn the magic words to get the magnet to work. The first word is (hesitate for a minute) “Attract.” Say it with me. “Attract.”*
4. *If you want your magnet to bring something to you say, “Attract.”*
5. *Let’s work with our magnets.*
6. Demonstrate before you send them to the station.
7. *Take one magnet and dip one end into the iron filings. With a partner holding another magnets with opposite colors next to each other and say, “Attract.” See if they stretch out and touch each other.*
8. Divide the class into groups of three or four. Have them walk to the workstation.
9. Give the class a few minutes to get the filings to stretch out and touch each other. Someone should discover that some of the filings do not want to touch.
10. Have the class stop after about two minutes. Have the students put their magnets down.
11. *Did everyone get their magnets to do what you asked them to do? (Yes and No)*
12. *The next magic word is repel. Say it with me, “Repel.” Hold the magnet next to the same color.*
13. *If you want your magnet to push something away say, “Repel.”*
14. *Can anyone show us how to make your magnet repel?*
15. *Can anyone show us how to make your magnet attract?*

16. Have students put their magnets down and you set two Hot Wheels cars in each station. Give each group a piece of tape.
 17. Have the students tape one magnet to the top of each car. Wipe off the iron filings as needed.
 18. *You will get to control this car without using your hands. Say the magic words and put opposite colors together to make it attract. Who can tell me what that means? Say the magic word to make it repel. Who can tell me what that means? Use the same colored ends of your magnet to get your car to do what you want.*
 19. Give the class three to four minutes to move the car to them and away from them.
 20. Have the students stop and set all their cars and magnets down and quietly return to their seats.
 21. Discuss why the magnet was able to attract and repel. *Was it the magic words that made the iron filings attract toward the other magnet?* (No)
 22. *Did the magic words make the cars move?* (No)
 23. *Magnets attract or repel metal on their own. We don't have to say magic words to get them to work.*
 24. *If you put the same colored ends of your magnet together what happens?* (repel)
 25. *If you put the opposite colored ends together what happens?* (attract)
 26. Draw pictures on the board of magnets with same poles repelling. Draw another picture with opposite poles attracting. (See Appendix E for an example of how to do this.)
 27. *Magnets with the same ends pushed each other away or repelled the other magnet. (Show example with the car.) Magnets with opposite colored ends brought the other magnet to it or attracted it. (Show example with car.)*
 28. *Now you will get a chance to show me how magnets attract and repel.*
 29. Give each student a piece of paper, pencil and two different colored crayons.
 30. Have them draw a picture of magnets repelling and attracting. Give each student a paper, pencil and two different colored crayon.
 31. Have the students fold their paper in half horizontally.
 32. *On the top half of your paper, draw a magnet on your paper. Divide it in half and color the half on the right side.*
 33. *Draw another magnet across from it. Divide it in half and color the half on the left side.*
 34. *Draw arrows to show if this is repelling or attracting.*
 35. *Go to the bottom half of your paper.*
 36. *Draw a magnet and divide it in half. Color the first half.*
 37. *Draw another magnet across from it and divide it in half. Color the first half of it.*
 38. *Draw arrows to show if these magnets are repelling or attracting each other.*
 39. It should look like Appendix E. (Modification: Have students demonstrate how magnets attract and repel by using actual magnets,)
 40. Collect the pictures and evaluate their understanding of repelling and attracting magnets correctly.
- E. *Assessment/Evaluation*
1. Use Appendix E to check understanding of repel and attract.

Lesson Four: Powering Through (45 minutes)

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. Students will understand that information can be gathered through observation and experimentation.

- b. Students will recognize that there are forces in the world created by natural phenomenon that we can't see but which nonetheless have a real effect on objects that we can see.
 - 2. Lesson Content
 - a. Magnetism demonstrates that there are forces we cannot see that act upon objects.
 - b. Magnetic field (strongest at the poles)
 - 3. Skill Objective(s)
 - a. Students will identify the properties of magnets.
- B. *Materials*
- 1. Magnets – one per student, plus two extra for the teacher
 - 2. Paperclips – 20 per student
 - 3. Two rulers
 - 4. One per student of the following:
 - a. Large, flat, rectangular eraser
 - b. Straight pin
 - c. One piece of tape
 - d. Four large books
 - e. Water – four cups
 - f. 2" x 2" paper
 - g. 9" x 13" glass or plastic pan
 - h. Appendix F – a half sheet for each student
 - i. Pencil
- C. *Key Vocabulary*
- 1. *Magnetic field* is the push and pull from a magnet.
- D. *Procedures/Activities*
- 1. Before the lesson set two large books in two stacks on a table. Set the glass pan on top of the books. There should be at least two inches between the table and the pan. Put the water next to the pan. Tape one magnet on each of the two rulers. Set the rulers next to the stacks of books on table.
 - 2. *Today we will be scientists again and learn how magnets can share their power and work through other objects.*
 - 3. Pass out magnets and paperclips to each student.
 - 4. *See if you can get the magnet to pick up the paperclip.*
 - 5. *Who can tell me why the magnet is picking up the paperclips?* (The paperclips are metal.)
 - 6. *Put the tip of one paperclip on the magnet. Put another paperclip onto the first paperclip.*
 - 7. *Are the paperclips staying? (Yes) Put your paperclips and magnets down.*
 - 8. *The paperclips closest to the magnet will have the strongest pull. The further you get from the magnet, the weaker it will become.*
 - 9. *Let's make a prediction of how many paperclips you can connect to the magnet. (Write your prediction onto the board.)*
 - 10. *Now you will have the chance to see how many you can connect. (Give the students about five minutes.)*
 - 11. *How many did you connect?* (Record your results next to the predictions on the board.)
 - 12. *The magnet is passing its power through the paperclip. Where is the power the strongest?* (Closest to the magnet.)
 - 13. *Where is the power of the magnet the weakest?* (The furthest point away from the magnet.)

14. *Now we will see how a magnet can pass power through other objects. We are going to have a boat race.*
 15. Pass out the eraser, pin, tape, and magnet.
 16. Have the students tape the magnet to the eraser. This will be the bottom of the boat.
 17. Carefully poke the straight pin through the 2" x 2" square of paper through the middle of the top and again through the middle of the bottom. It should look like a square sail. (You can prepare the sails ahead of time.)
 18. Poke the pin into the eraser.
 19. Have the students walk quietly to the table where the books and water are located with their boats.
 20. Pour enough water into the pan so that there is about 1" of standing water in the pan.
 21. Have two students place their boats in the small end of the pan. With the rulers, the students will put the magnet side under their boat on the bottom of the glass pan and slide the ruler to make the boat move.
 22. Race each boat to the end.
 23. Have students complete the worksheet, Appendix F.
 24. Collect and evaluate the students understanding of how magnets share their power and work through other objects.
- E. *Assessment/Evaluation*
1. Use Appendix F to check understanding of magnetic force.

Lesson Five: Fields of Force (45 minutes)

A. *Daily Objectives*

1. Concept Objective(s)
 - a. Students will understand that information can be gathered through observation and experimentation.
 - b. Students will recognize that there are forces in the world created by natural phenomenon that we can't see but which nonetheless have a real effect on objects that we can see.
2. Lesson Content
 - a. Magnetism demonstrates that there are forces we cannot see that act upon objects.
 - b. Magnetic field (strongest at the poles)
3. Skill Objective(s)
 - a. Students will identify the properties of magnets.

B. *Materials*

1. Overhead
2. One blank transparency
3. Iron filings
4. Appendix G (diagram of magnetic field)
5. Large paperclips – one per student
6. 18" string – one per student
7. Tape – one piece per student
8. Magnet – one per student plus one for you
9. Drawing paper – one per student
10. Pencil – one per student

C. *Key Vocabulary*

1. *Magnetic field* is the push and pull from a magnet.
2. *Force* is the power or strength of an object.

D. *Procedures/Activities*

1. Before you start your lesson, tie one paperclip to each piece of string.
2. *Today scientists, we are going to look at magnets and the force around them.*
3. Lay the blank transparency on the overhead. Put a magnet in the middle of the transparency. Carefully spread the iron filings around the magnet.
4. The filings will become magnetized by the invisible magnetic field.
5. Point out to students that most of the filings will go to the ends of the magnet.
6. *This experiment shows you the field of force from a magnet. (Don't put this away. You will need it at the end of the lesson.)*
7. *You are going to have a chance to discover the invisible field of force around your magnet. We are going to make an invisible kite.*
8. Pass out a magnet, paperclip, string, and tape to each student.
9. *Tape your string to the middle of your desk.*
10. *Pick up your magnet. **Without touching** your paperclip with your magnet, lift the paperclip off the table.*
11. *Fly your kite around your desk.*
12. *See if you can pull your magnet farther away from your paperclip.*
13. *How far can you pull it before it falls?*
14. Allow the students to experience with their kites for about seven minutes.
15. *Who can tell me what made the kites fly? (The magnetic field)*
16. *What would happen if I had a stronger magnet? (The magnetic field would be bigger.) What would happen if I had a weaker magnet? (The magnetic field would be smaller.)*
17. Collect the magnets and kites.
18. Give each student a piece of paper and a pencil.
19. *Who can tell me what we call the power around the magnet? (A magnetic field)*
20. Show the students the overhead with the iron filings on it again.
21. *See how the filings surround the magnet and most of them are going to go to the ends?*
22. *See how far the magnetic field goes around this magnet?*
23. *Who can tell where the field ends? (Where the filings are not magnetized.)*
24. *You will show me the magnetic field on your paper.*
25. Pass out paper and pencil to each student.
26. *In the middle of your paper, draw a magnet. Divide it in half and shade one-half with your pencil.*
27. *Use your pencil to show how the magnetic field around the magnet looks. Use curved lines to demonstrate.*
28. Collect and evaluate that their drawing demonstrates their understanding of the field of force.

E. *Assessment/Evaluation*

1. Use Appendix G as an example to compare to their work.

Lesson Six: Earth is a Magnet (45 minutes)

A. *Daily Objectives*

1. Concept Objective(s)
 - a. Students will recognize that there are forces in the world created by natural phenomenon that we can't see but which nonetheless have a real effect on objects that we can see.
2. Lesson Content
 - a. Magnetic poles: north-seeking and south-seeking poles

- b. The earth behaves as if it were a huge magnet: north and south magnetic poles (near; but not the same as, geographic north pole and south pole)
 - 3. Skill Objective(s)
 - a. Students will identify the properties of magnets.
- B. *Materials*
 - 1. Globe
 - 2. Magnets – one per student plus one for you
 - 3. Iron nail – one per student
 - 4. Paperclip – one per student
 - 5. 3” x 3” squares of sponge
 - 6. Marker – one per student
 - 7. Bowls – one per student
 - 8. 1/2 cup water in each bowl
 - 9. Paper towel – one per student
 - 10. Appendix H (Assessment worksheet) – one per student
 - 11. Scissors – one per student
 - 12. Glue – one per student
- C. *Key Vocabulary*
 - 1. *Poles* are either end of a magnet.
 - 2. *Magnetic north* and *south* are the magnetic poles on the earth.
- D. *Procedures/Activities*
 - 1. Before you begin your lesson, fill each bowl with water and label the room with north, south, east and west.
 - 2. *Scientists, we are going to learn about another magnet. Did any of you know that we live on a giant magnet? The earth is a giant magnet. It is similar to the magnets we have been using all week.*
 - 3. *Let’s look at this magnet. (Hold up a magnet)*
 - 4. *The ends of the magnet have special names. Would anyone like to guess what we call the ends of a magnet? We call the ends poles.*
 - 5. Hold up the globe.
 - 6. *The earth has poles as well. What do we call them? (north and south poles)*
 - 7. *Look at this magnet. (Put the globe down and hold up the magnet.)*
 - 8. *We call the ends of this magnet north and south poles as well.*
 - 9. *The earth has magnetic poles in the north and in the south. They are different from the geographic north and south poles. In fact, the magnetic poles of the earth move around.*
 - 10. *The strongest pull from the magnet we call earth comes from the magnetic poles.*
 - 11. *Let’s try to experiment to see if this is true.*
 - 12. Pass out a magnet, sponge, paperclip, marker and a nail to each student.
 - 13. *Let’s remember the experiment we did when we shared magnetic power from the magnet to the paperclip. Can we pass the magnetism from a magnet to another object? (Yes)*
 - 14. *We are going to magnetize this nail. (Demonstrate as you do this.)*
 - 15. *Take the nail and hold it by the head of the nail. Grab your magnet and rub the magnet starting at the head and go to the point. Pick up the magnet and start at the head and go to the point again. Repeat this five times.*
 - 16. Emphasize to the students not to rub back and forth. The magnet should only go one direction or it will not magnetize.
 - 17. *Now try to pick up the paperclip. You have magnetized it.*

18. *Now let's change the poles. Grab the nail by the point and rub down to the head. Pick up your magnet and repeat. (Demonstrate) Try to pick up the paperclip with the nail.*
 19. *Now, magnetize your nail from the head down again.*
 20. *Lay your nail on the sponge. Watch to see which direction it turns. Look on the wall and find north, south, east and west. Pass out the bowls of water and paper towels.*
 21. *When I count to three, carefully put your sponge in the water so it floats on top. Don't let it sink.*
 22. *1, 2, 3... Let the students put the sponge on top of the water.*
 23. *Who can tell me what happened? (It rotated to point north)*
 24. *Is your neighbor's nail point pointing the same direction as yours? (Yes)*
 25. *The nail turned to point to the strongest of earth's poles. It is pointing north.*
 26. *Remember that the Chinese used magnets to find their way at sea with spoon shaped lodestone. Your magnetized needle will always point north.*
 27. *Let's see if that is true. Magnetize your needle from the point to the head. Take out your sponge and nail and set it on your desk.*
 28. *Let the students repeat the experiment.*
 29. *Collect magnets, nails, sponges, and bowls.*
 30. *Use Appendix H to evaluate how well students understand the concept of the magnetic poles.*
- E. *Assessment/Evaluation*
1. *Appendix H to evaluate the understanding of the location of the earth's magnetic poles and geographic poles.*

Lesson Seven: Compasses (45 minutes)

- A. *Daily Objectives*
1. **Concept Objective(s)**
 - a. *Students will understand that information can be gathered through observation and experimentation.*
 - b. *Students will recognize that there are forces in the world created by natural phenomenon that we can't see but which nonetheless have a real effect on objects that we can see.*
 2. **Lesson Content**
 - a. *Orienteering: use of a magnetized needle in a compass, which will always point to the north*
 3. **Skill Objective(s)**
 - a. *Students will identify the properties of magnets.*
- B. *Materials*
1. *Compass – one for every two students*
- C. *Key Vocabulary*
1. *A compass is a tool used to find directions.*
- D. *Procedures/Activities*
1. *Today we will be using our earth to help us find directions. (Hold up a compass)*
 2. *Who can tell me what this is? (a compass) This compass helps people find directions. Its needle will always point to the north. Today, I am going to show you how to find directions with a compass.*
 3. *Group the students into partners. Give each pair a compass. Have them sit with their partner while you demonstrate.*

4. *Set your compass flat onto the palm of your hand. The needle is pointing north. Turn so that you are facing north. (Wait while students move.) The needle should be straight in front of you.*
 5. *South is opposite of north. Turn so that you are facing south. (Wait while students move.) Turn your compass so the S for south is in front.*
 6. *Where is the needle pointing now? (Down at North)*
 7. *What does the E stand for? (East)*
 8. *East is to the left of south. Turn so that you are facing east. (Wait while students move and turn their compasses.) Which way is the needle pointing? (North)*
 9. *What does the W stand for? (West)*
 10. *West is the opposite of east. Turn so you are facing west. (Wait while students move.)*
 11. *Which way is the needle pointing? (North)*
 12. *The needle will always point north. Let's practice using our compass. I am going to give you some directions, and you are going to follow them.*
 13. *Take the students outside or into a large room.*
 14. *Turn so you are facing the north. Take five steps north. Look at your compass.*
 15. *Stop. Turn west. Look at your compass. Skip two steps.*
 16. *Stop. Turn south. Look at your compass. Hop on one foot three times.*
 17. *Stop sit down where you are.*
 18. *Which way did the needle point all the while you were moving? (North)*
 19. *Even when we were jumping and hopping and skipping it never stopped pointing north.*
 20. *Students will work in partners and give each other directions using the words north, south, east and west.*
 21. *The teacher will listen and guide each student group individually while the other groups are practicing.*
- E. *Assessment/Evaluation*
1. *Students will be assessed at the end of the unit. (Appendix I)*

VI. CULMINATING ACTIVITY

- A. *Review with questions from Appendix I. Ask a question and toss shelled peanuts to the students who answer correctly.*
- B. *Give Magnet Unit Test (Appendix I) to students.*
- C. *Check with Appendix J.*

VII. HANDOUTS/WORKSHEETS

- A. *Appendix A: What is Magnetic?*
- B. *Appendix B: Magnetic chart*
- C. *Appendix C: Background Notes*
- D. *Appendix D: Where's the Lodestone (Game)*
- E. *Appendix E: Repel and Attract*
- F. *Appendix F: Magnet Review*
- G. *Appendix G: Magnetic Field*
- H. *Appendix H: Earth is a Magnet*
- I. *Appendix I: Magnet Unit Test*
- J. *Appendix J: Answer Key*

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Appendix A

What is Magnetic?

Put an X by any item that is magnetic.



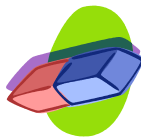
Penny ___



toothpick ___



Paperclip ___



eraser ___



Nail ___



Aluminum foil ___



bolt ___



Rubber band ___



key ___

Appendix B

MAGNETIC

NOT MAGNETIC

Cut out words and place on the chart under the correct heading.

A collection of nine objects, each enclosed in a dotted rectangular border, intended for cutting out and classification. The objects are: a yellow dollar sign, a purple and blue gemstone, a black rectangle, a vertical wooden dowel, a hand holding paper clips, a purple ring, a blue and white bolt and nut, a hammer and nails, and a yellow key.

Appendix C

Back Ground Notes for Magnes

There was a Greek Shepard named Magnes who was tending his sheep, He had been a Shepard his whole life. It was a good life. He could take a nap when he wanted, eat when he wanted and walk the countryside whenever he chose. He often would walk over rocks to look for wolves or other animals that could attack his sheep. One day while he was standing on one of these rocks, he saw a very pack of wolves. He began to jump down, but his foot was stuck and he tried to move his staff to steady himself, it was stuck as well. He thought that he was cursed by the gods and prayed that he would be released. He used all of his strength and pulled his foot off the rock and his staff and chased after the wolves and protected his flock. He returned to the rock and found that he became stuck again. He pulled a piece off the rock and took it back to his village. The stone that became know as lodestone was thought to have magical powers. People would wear it and keep it near them. We call lodestone today magnetite.

Background Notes for China

A long time ago in China, people discovered lodestone and realized that it always pointed in the same direction when it hung on a string. The Chinese made the first compass. A compass points North and South. It helped people find their way when they were traveling on the sea. They used lodestone or magnetite and shaped it into the shape of a spoon. They called them South pointers. The handle would point south and the bowl would point to the North.

Where's the Lodestone? (Game)

This game should be played outside or in a large room. The object of the game is for one team to find lodestone.

Materials:

40 small cones or boxes

18 magnetic items (there can be repeats of the same item)

One Lodestone or Rock

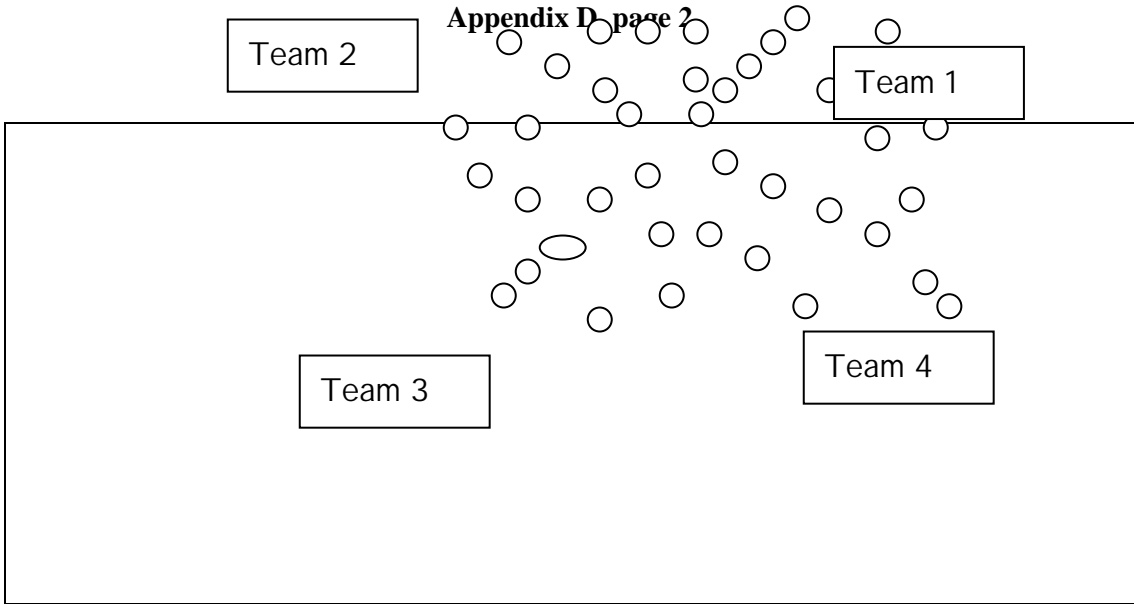
One Compass

20 non-magnetic items (there can be repeats of the same item)

Directions:

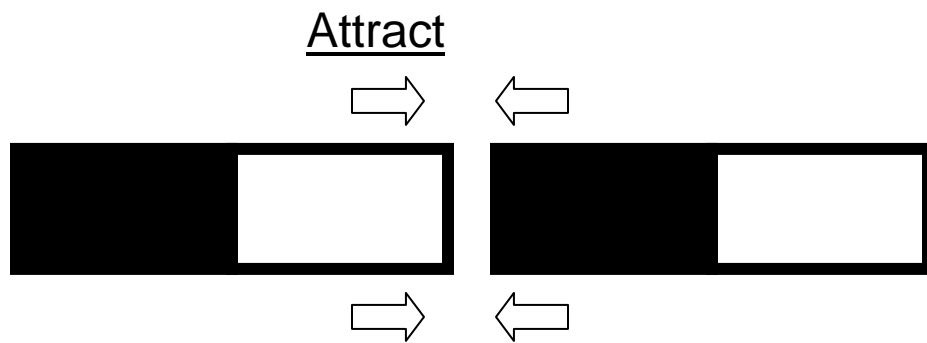
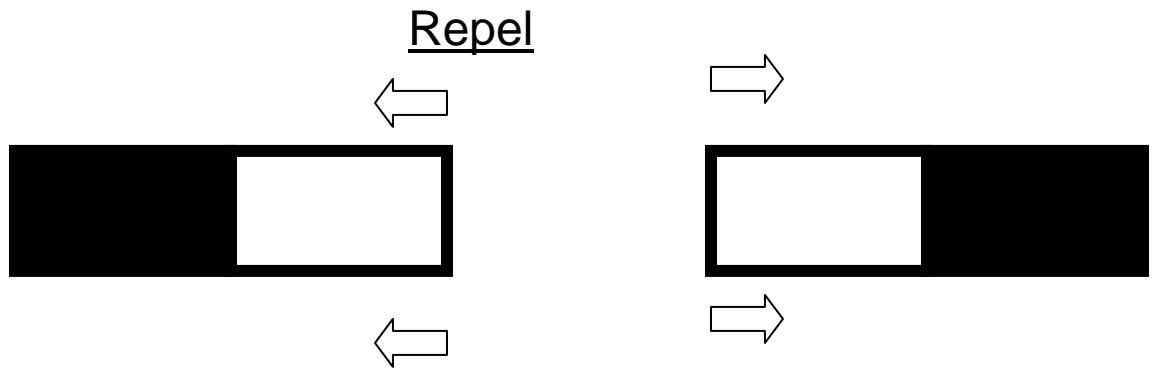
1. Place 20 cones in a large X. Place the remaining 20 cones in the middle of the X (see Diagram).
2. Under each cone, place a magnetic or non-magnetic item.
3. Under one of the cones place the lodestone
4. Under one cone place the compass telling where the lodestone can be found.
5. Divide the students into four groups.
6. Each team stands at each tip of the X of cones.
7. When the teacher says, "Go!" one student from each team will run to the middle of the X and pick from any of the cones and find the item.
8. If the item is magnetic, they will take it back to the team and tag the next person.
9. If it is not magnetic, they will leave it under the cone.
10. If a team finds the lodestone, they win immediately.
11. If a team finds the compass, the next person in line can use the clues to find the lodestone.
12. The first team to locate the lodestone is the winner!
13. If after everyone has gone, no one has located the lodestone, count how many magnetic items that each team has found.
14. The team with the most magnetic items wins.

Appendix D, page 2



Appendix E

Repel and Attract



Appendix F

Magnet Review

Name _____

Circle Yes or No after each question.

- | | | |
|--|-----|----|
| 1. Can a magnet share its power with another object? | Yes | No |
| 2. Do magnets work through paper? | Yes | No |
| 3. Will a magnet attract a plastic straw? | Yes | No |
| 4. Does a lodestone have real magic power? | Yes | No |
| 5. Will a compass help you do your homework? | Yes | No |

Magnet Review

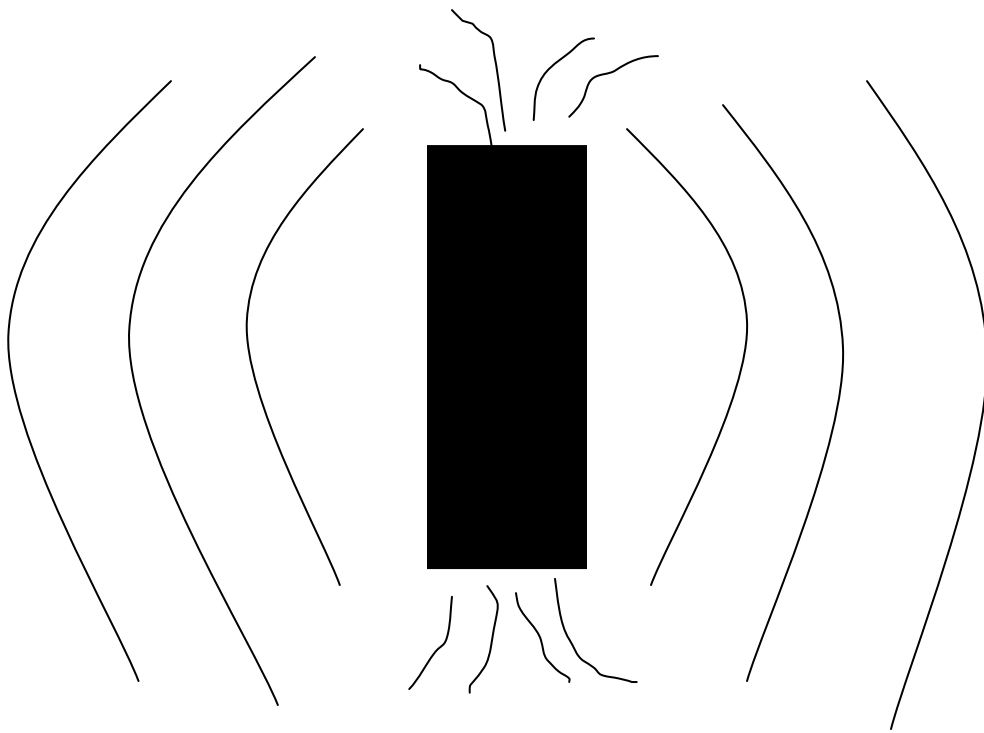
Name _____

Circle Yes or No after each question.

- | | | |
|--|-----|----|
| 1. Can a magnet share its power with another object? | Yes | No |
| 2. Do magnets work through paper? | Yes | No |
| 3. Will a magnet attract a plastic straw? | Yes | No |
| 4. Does a lodestone have real magic power? | Yes | No |
| 5. Will a compass help you do your homework? | Yes | No |

Appendix G

Magnetic Field



Appendix H

Earth is a Magnet

Checklist of Skills

Have each student show each of the following items on a globe.

- ___ 1. Show the country where the magnetic north pole is located
- ___ 2. Show where the geographic north pole is located.
- ___ 3. Show where China is located.
- ___ 4. Show where Greece is located.

Earth is a Magnet

Checklist of Skills

Have each student show each of the following items on a globe.

- ___ 1. Show the country where the magnetic north pole is located
- ___ 2. Show where the geographic north pole is located.
- ___ 3. Show where China is located.
- ___ 4. Show where Greece is located.

Appendix I
Magnet Unit Test

Name _____

Match the correct word to the meaning.

- | | |
|-----------------------------|---|
| 1. Magnet | A. Natural stone with magnetic properties |
| 2. Magnetism | B. To push away |
| 3. Lodestone | C. An instrument used for finding north, south, east and west |
| 4. Repel | D. To pull |
| 5. Attract | E. The push and pull surrounding a magnet |
| 6. Magnetic Field | F. Where the magnetic pull is the strongest |
| 7. Pole | G. The magnetic pull of the earth |
| 8. Magnetic North and South | H. A piece of metal that attracts other metal. |
| 9. Compass | I. A force that cannot be seen that pushes and pulls metal objects. |

Circle Yes or No after reading each question.

- | | | |
|---|-----|----|
| 10. The Chinese first used lodestones as compasses. | YES | NO |
| 11. A Greek Shepard discovered lodestone. | YES | NO |
| 12. Plastic is pulled toward a magnet. | YES | NO |

Draw arrows showing magnets attracting and repelling each other.

Attract

Repel

Appendix J
Magnet Unit Test (Key)

Name _____

Match the correct word to the meaning.

- | | | |
|-----------------------------|----|--|
| 1. Magnet | A. | Natural stone with magnetic properties |
| 2. Magnetism | B. | To push away |
| 3. Lodestone | C. | An instrument used for finding north, south, east and west |
| 4. Repel | D. | To pull |
| 5. Attract | E. | The push and pull surrounding a magnet |
| 6. Magnetic Field | F. | Where the magnetic pull is the strongest |
| 7. Pole | G. | The magnetic pull of the earth |
| 8. Magnetic North and South | H. | A piece of metal that attracts other metal. |
| 9. Compass | I. | A force that cannot be seen that pushes and pulls metal objects. |

Circle Yes or No after reading each question.

- | | |
|---|---------------|
| 10. The Chinese first used lodestones as compasses. | <u>YES</u> NO |
| 11. A Greek Shepard discovered lodestone. | <u>YES</u> NO |
| 12. Plastic is pulled toward a magnet. | YES <u>NO</u> |

Draw a picture showing magnets attracting and repelling each other.

