Name _____

Date _____

PROJECT IDEAS

- Can you design a new investigation using the balance and magnets (like you did in Investigation 1)? For example, use washers in place of spacers, more magnets, or different magnets.
- Can you find a set of insulators and conductors at home? How would you prove that they are conductors or insulators?
- Can you make a conductor/insulator tester using a lightbulb as an indicator instead of the motor?
- Does a D-cell last longer in a series circuit or in a parallel circuit?
- Can you use iron filings to show the magnetic field around a wire carrying current?
- Can you think of more variables to test to change the strength of an electromagnet?
- What happens if you wind the wire half one way and half the opposite way to make an electromagnet?
- Look in the *FOSS Science Stories* or books in the library for ideas about projects you might like to present to the class.
- Can you make one of the toys you read about in the *Magnificent Magnetic Models?*
- Can you make a water compass?
- Can you design some magnetic art using magnets and iron filings?
- Can you design a magnetic message board?
- Can you write an instruction booklet to show someone how to set up five different circuits?
- Can you make a quiz board that lights up when someone has chosen the right answer?
- Can you build a model motor?
- Can you hook up more than two telegraphs to send and receive messages?
- Can you build a cardboard telegraph?
- Can you build a lunchbox alarm? Another kind of alarm?
- Can you create a new kind of electric message sender? Can you create a new code?

Name _____

Date _____

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 1: THE FORCE

BUYING MAGNETS

A teacher wants to set up a Magnet Exploration Center where students can find out more about magnets during their free time. She has $50.00 to spend. She looked in the magnet section of a science catalog and found these prices.

ITEM	QUANTITY	PRICE
Large bar magnets	Set of 2	$10.95
Small bar magnets	Each	$2.75
Large horseshoe magnets	Each	$7.95
Small horseshoe magnets	Each	$4.50
Disk magnets	Set of 4	$4.50
Lodestones	Set of 10	$7.95

1. What materials would you recommend she buy for the Magnet Exploration Center? (Remember, she has only $50.00 to spend.)

2. Write a paragraph about why you chose the items you did.

Name _____

Date _____

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 2: MAKING CONNECTIONS

TESTING C-CELLS

The students in Mrs. Ray's fourth-grade class had a question:

Do all brands of batteries last the same length of time, or do some kinds keep on going after the others have run out of energy?

The students decided to do an experiment. They agreed they should use brand new C-cells for their test. Here is a list of the C-cells they got.

3 **Charger** industrial-strength C-cells

3 **E-Z Volt** alkaline C-cells

3 **Amp-Champ** alkaline C-cells

The students connected each cell to a motor and let it run every day while they were in class. They disconnected the motors every night just before they went home. They kept track of the number of hours each motor ran. Here are the results they recorded.

KIND OF C-CELL	#1	#2	#3
Charger	30 hours	25 hours	20 hours
E-Z Volt	30 hours	40 hours	35 hours
Amp-Champ	25 hours	40 hours	40 hours

1. Based on these data, which brand of cell would you buy? _____

   (Show your math here.)

2. Explain why you chose that brand.

_____

_____

_____

_____

_____

Name _____

Date _____

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 3: ADVANCED CONNECTIONS

PREDICTING WIRES

A student wants to know how many wires she will need to set up some circuits with different numbers of lightbulbs. She knows she will need two wires to connect one lightbulb to a battery. So she thinks maybe she will need two additional wires for each additional lightbulb she adds to her circuit. But she isn't sure. Can you help her figure out a way to predict how many wires she will need?

1. What if she were building **series circuits** with only one battery and some lightbulbs?

2. What if she were building a **series circuit** with one battery, a switch, and some lightbulbs?

3. What if she were building a **series circuit** and adding one battery for every lightbulb she added?

4. What if she were building a **parallel circuit** with one battery and some light bulbs?

Name _____

Date _____

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 4: CURRENT ATTRACTIONS

COMPARING ELECTROMAGNETS

A fourth-grade class in Texas had just finished building electromagnets. The students wanted to know if electromagnets worked the same in Florida, so they contacted their FOSS website penpals in Florida with a plan. Each class lifted little washers with 20-wind electromagnets and 40-wind electromagnets. After counting the number of washers, they each sent their results to the other class. When the numbers were organized, this is what they saw.

TEXAS

GROUP	20 WINDS	40 WINDS
1	14 washers	30 washers
2	15 washers	35 washers
3	14 washers	28 washers
4	13 washers	38 washers
5	16 washers	41 washers
6	17 washers	33 washers
7	19 washers	29 washers
8	20 washers	30 washers

FLORIDA

GROUP	20 WINDS	40 WINDS
1	18 washers	23 washers
2	13 washers	30 washers
3	16 washers	31 washers
4	17 washers	27 washers
5	20 washers	42 washers
6	18 washers	33 washers

Do you think electromagnets work the same in Texas as in Florida? Why or why not?

Name _____

Date _____

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 5: CLICK IT

PRESENTATION TIME

A class was preparing to give project presentations. One student objected when the teacher told the class they would have only 3 minutes to present their project to the class. "I really need 8 minutes," the student told the teacher. The teacher decided to leave it up to the students, but first they would have to calculate how much time that would be. They had to decide if they were willing to listen as long as it would take for everyone to give an 8-minute presentation.

1. If there were 15 students in this class, and everyone presented a project for 8 minutes, how many minutes would they have to be a good audience? How many hours is that?

2. If the class had 30 students, how long would the presentations take?

3. How long would 8-minute presentations take in your class?

4. How many minutes do you think each presentation should be? How long will that be for your class to listen? Why do you think this is a good plan?

Name _____

Date _____

HOME/SCHOOL CONNECTION

INVESTIGATION 1: THE FORCE

MAGNETS AT HOME

How are permanent magnets used around your home?

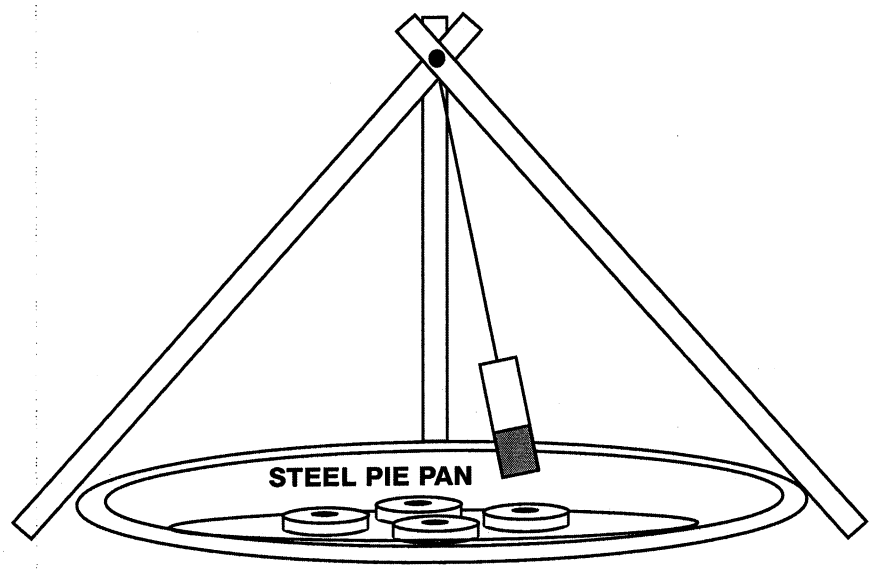
Places to check for magnets:

- Compasses
- Note holders on the refrigerator
- Cabinet and refrigerator door closers
- Toolboxes

Can you think of another way to use magnets around the house?

Can you invent a magnet game?

Talk over some ideas with your family and try some games out if you can. Draw a picture of your invention to share with the class, and write a paragraph explaining what it does.



Swinging Magnet Game

Name _____

Date _____

HOME/SCHOOL CONNECTION

INVESTIGATION 2: MAKING CONNECTIONS

WHERE'S THE ELECTRICITY?

Where's the electricity in your home? Take a tour and count the number of:

- Lights.
- Appliances that use electricity.
- Wall outlets where you can plug things in.
- Wall switches for turning on lights.

Be sure to talk with your family about safety when using electric appliances. Write your family safety rules below.

Name _____

Date _____

HOME/SCHOOL CONNECTION

INVESTIGATION 3: ADVANCED CONNECTIONS

WHAT'S INSIDE AN ELECTRONIC APPLIANCE?

If you have an old, broken radio, portable tape player, calculator, cassette player, remote control, walkie-talkie, or just about anything else that works on electricity, take a look inside. Look for advanced circuits to see where your knowledge of electricity can lead you.

Rules of engagement:

- Get approval from a parent before taking a device apart.
- Make sure the device is unplugged and batteries are removed.
- Get help opening the case. Remember, safety first.
- NO televisions, please. They can be dangerous to explore.

Things to look for and do:

1. You may be surprised to find very few wires. What kind of conductors are used in modern circuits instead of wires? Can you draw an example?

2. Can you find any familiar components like motors and lights? What function do they serve in the device?

3. Make drawings of one or two of the most common components you find.

NOTE: If you don't have an old device to take apart, draw a schematic of **one circuit** with two lightbulbs in parallel **in series with** a third lightbulb. Think about it...it can be done.

Name _____

Date _____

HOME/SCHOOL CONNECTION

INVESTIGATION 4: CURRENT ATTRACTIONS

Safety Note:

- Ask an adult to help you with this activity. Be sure to follow safety rules about electricity. Just look, don't touch!

FUSES AND CIRCUIT BREAKERS

Home electricity is provided by the electric utility company in your community. One large wire brings the electricity into your home. The wire can come to your home from a power line strung on poles, or from a cable underground. Can you find where the main electricity wire comes to your home?

You may have several wires coming to your home. Which one is the electricity? The trick is to look for the electric meter. The main wire always comes to the electric meter first. Why is there a meter on the electric line?

The electricity next goes to a fuse box or circuit-breaker box. The electricity divides and goes to several locations in your home. Each fuse or circuit breaker is included in a different circuit. How many circuits are in your home?

Wires are hidden inside the walls of your home. We connect our electric lights and appliances to the electric power in the walls by plugging them into electric sockets. How do you think plugging a lamp into a socket completes a circuit to light the lamp? Draw a schematic to show how you think it might work.