Electrical Circuits
Kit # 11

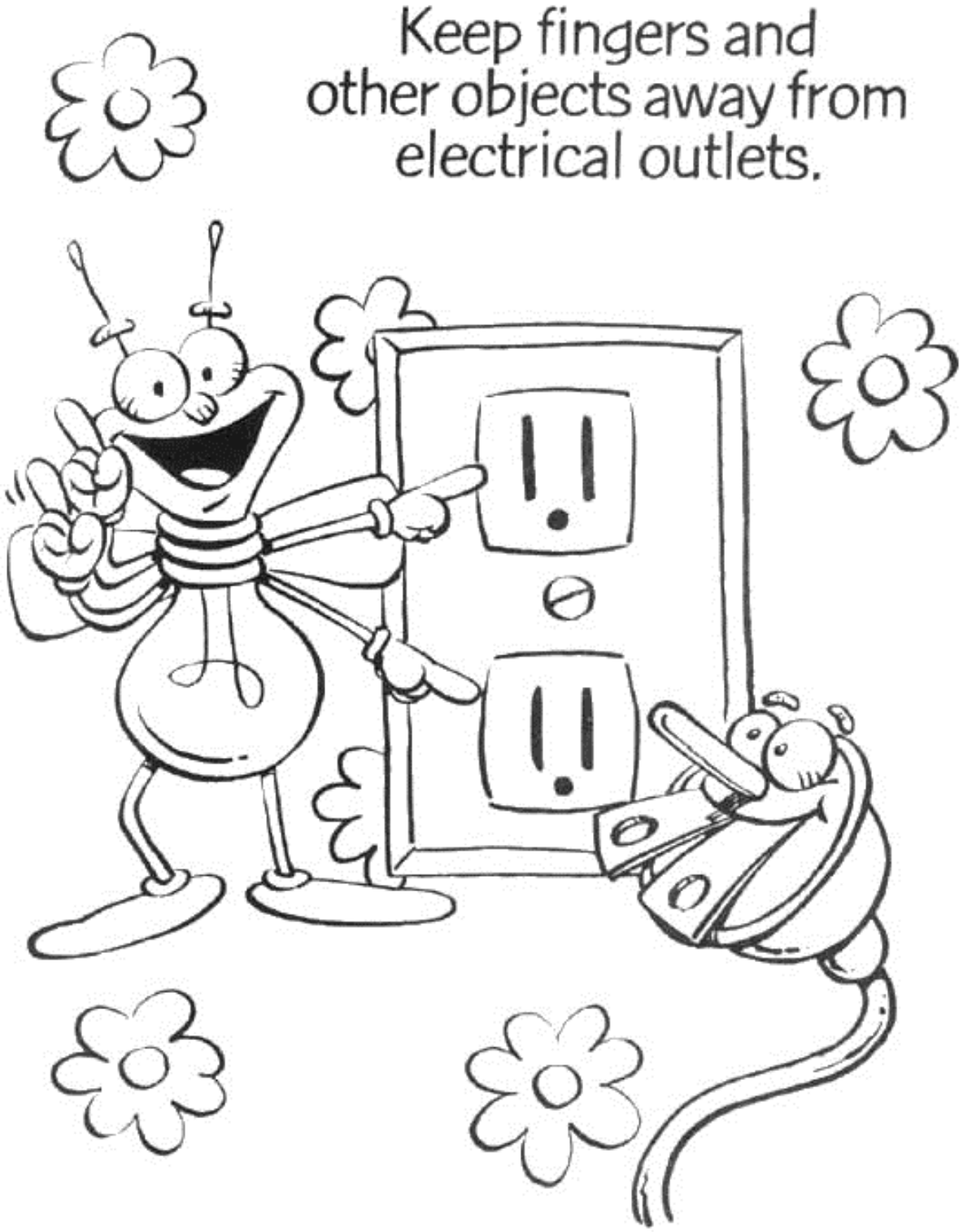
Blackline Masters

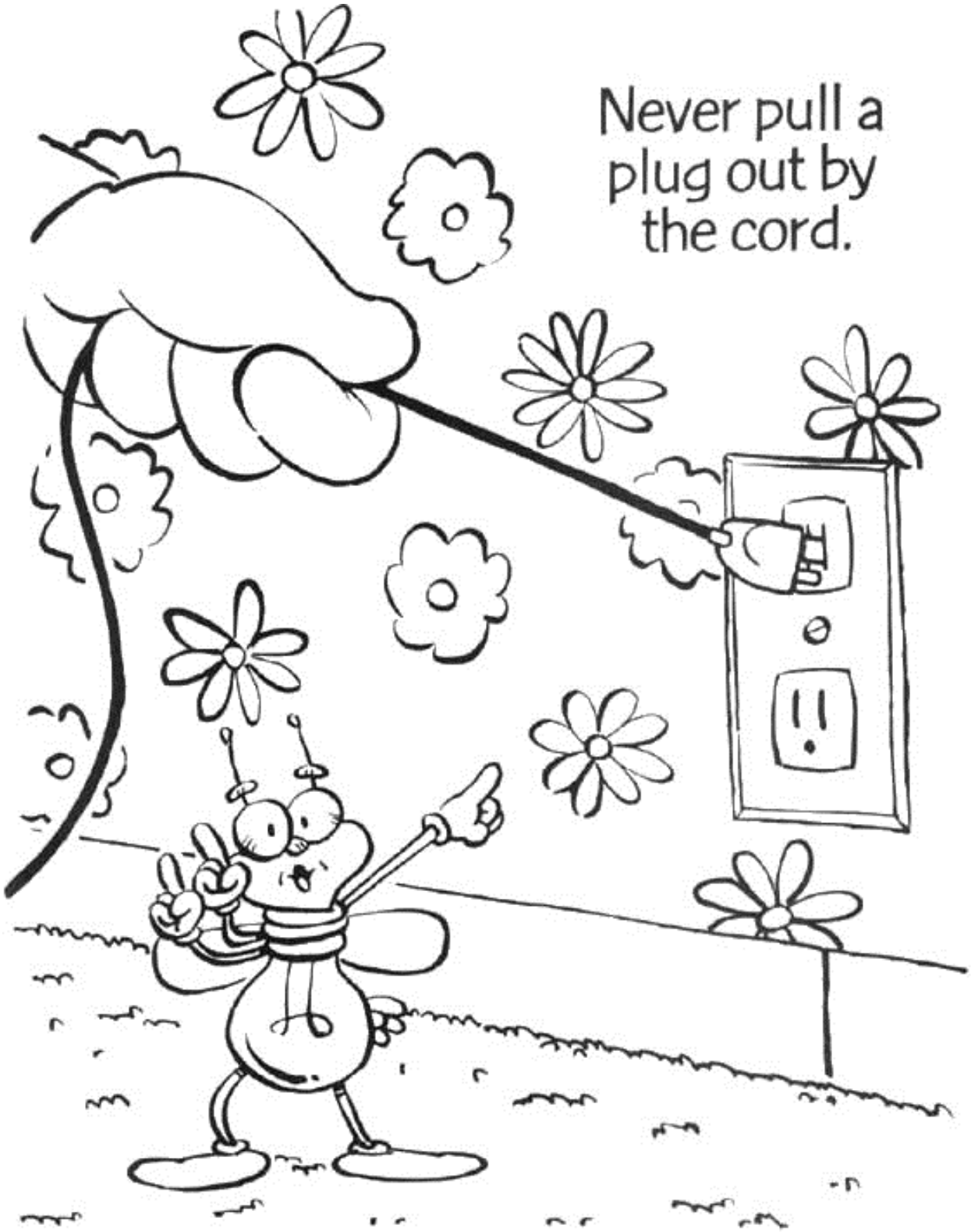
Revised July 2005
LOGO, footers- Revision May 2008
10/2015 Removed Word Search pg 23

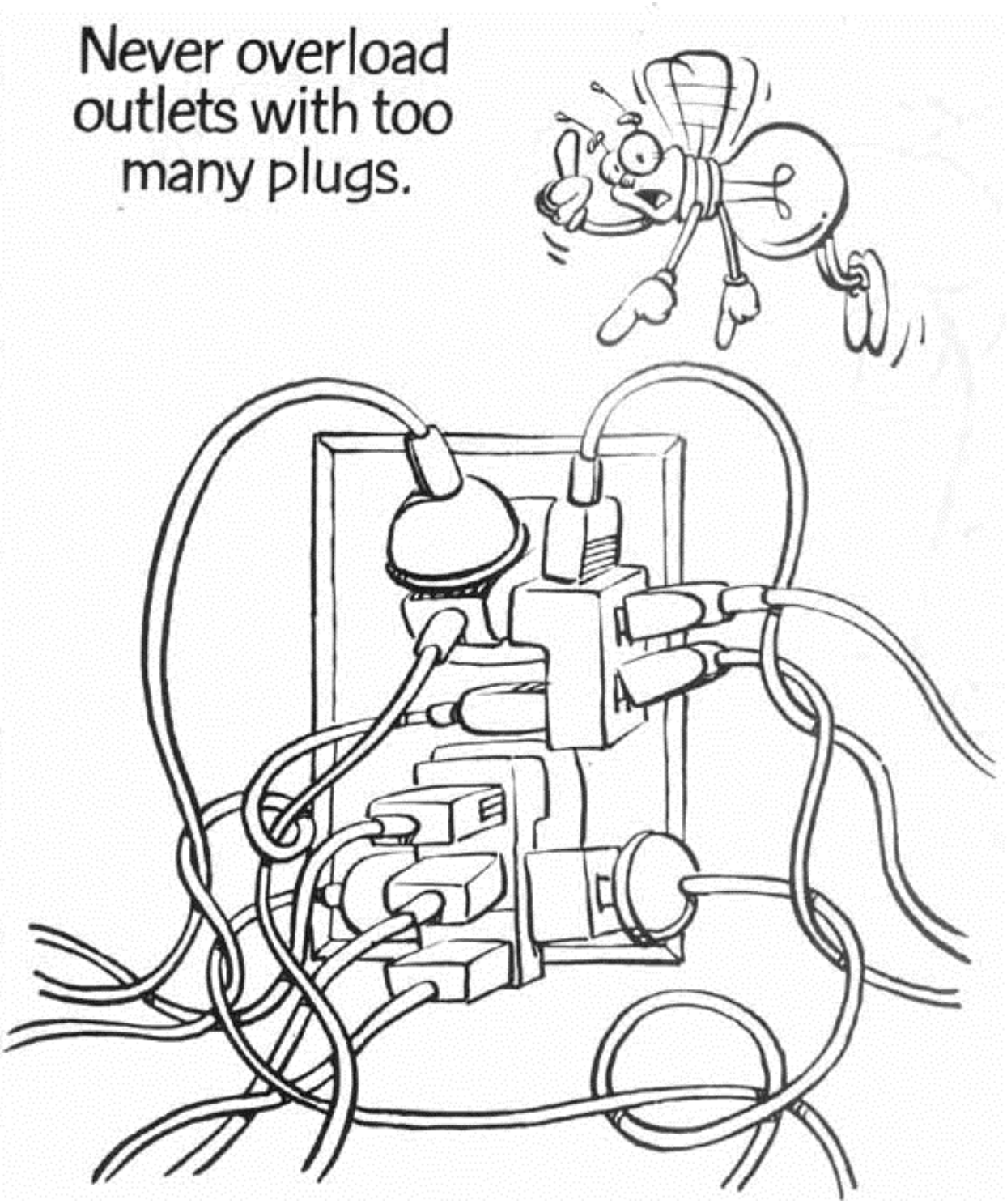
OCM BOCES Science Center

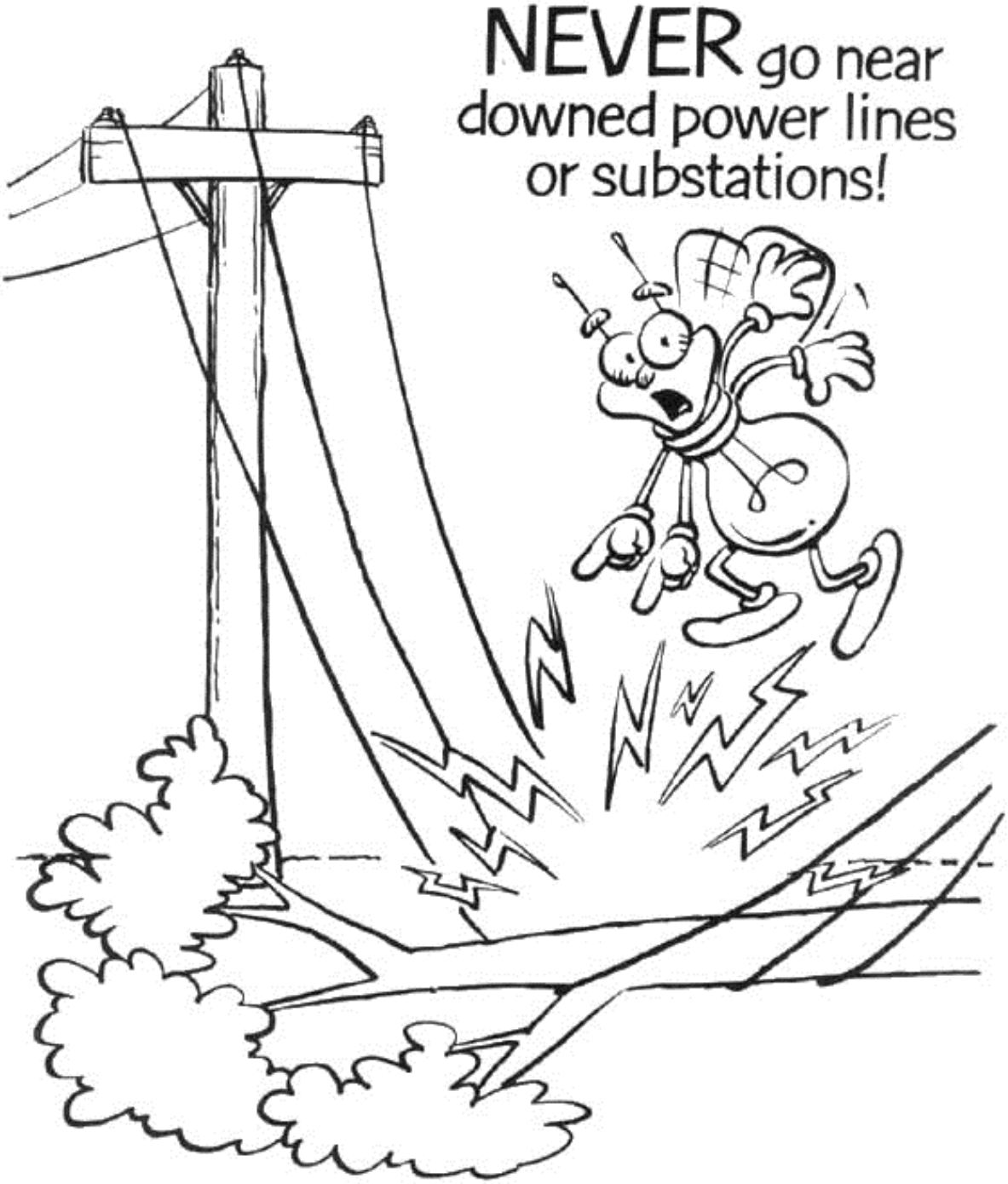
Remember, gang, you have to

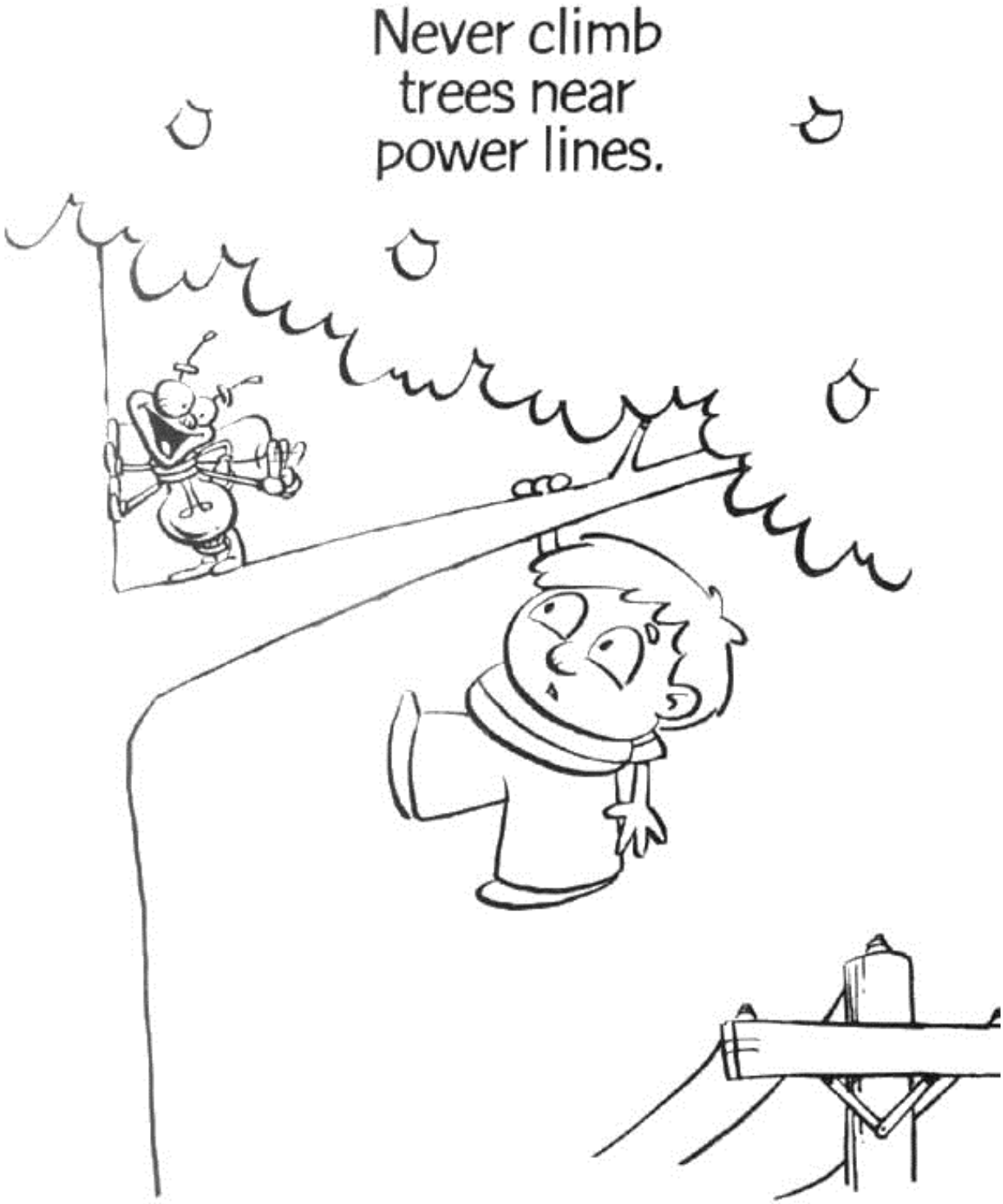
PLAY IT SAFE AROUND ELECTRICITY!

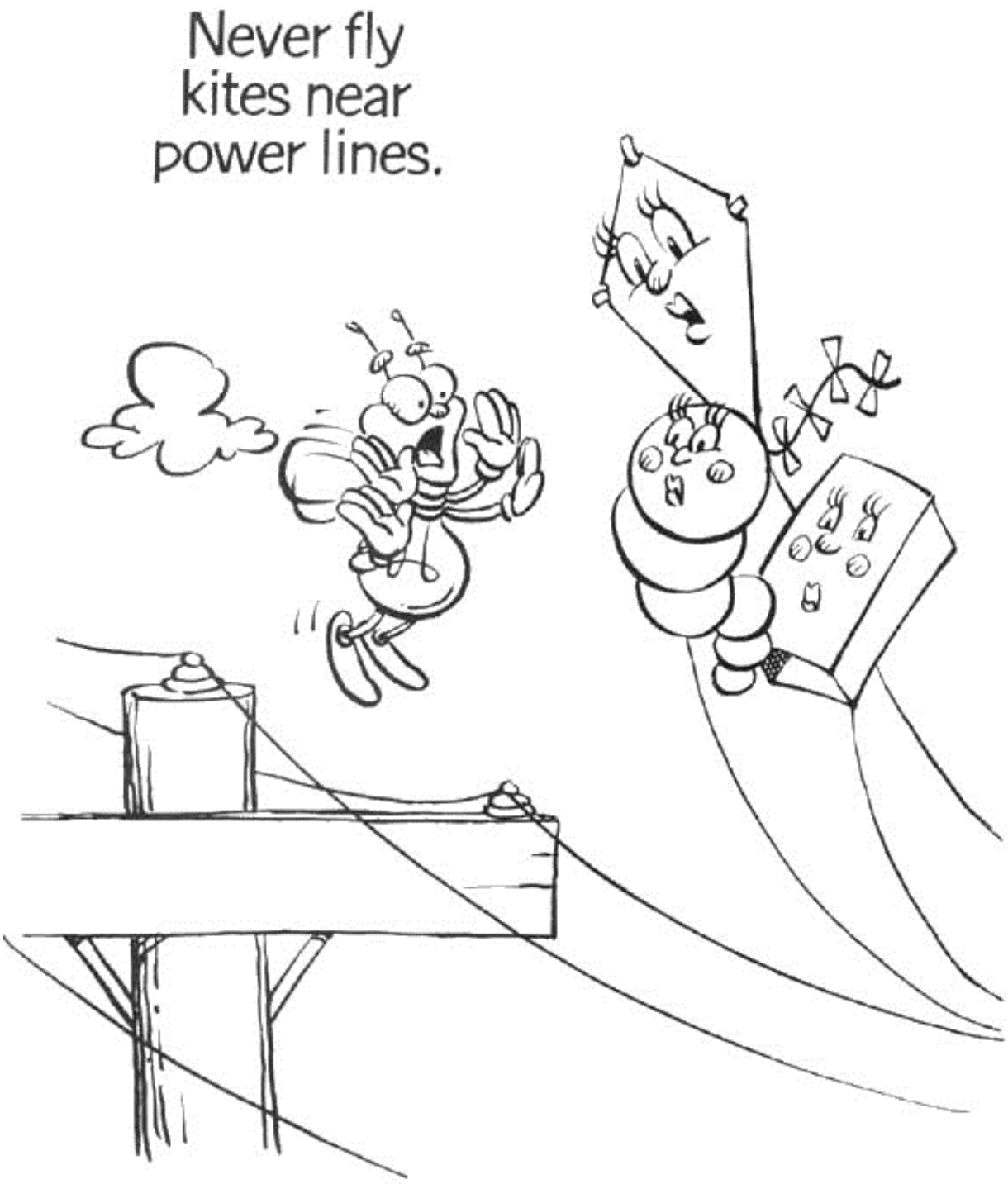

Keep fingers and
other objects away from
electrical outlets.


Never pull a plug out by the cord.

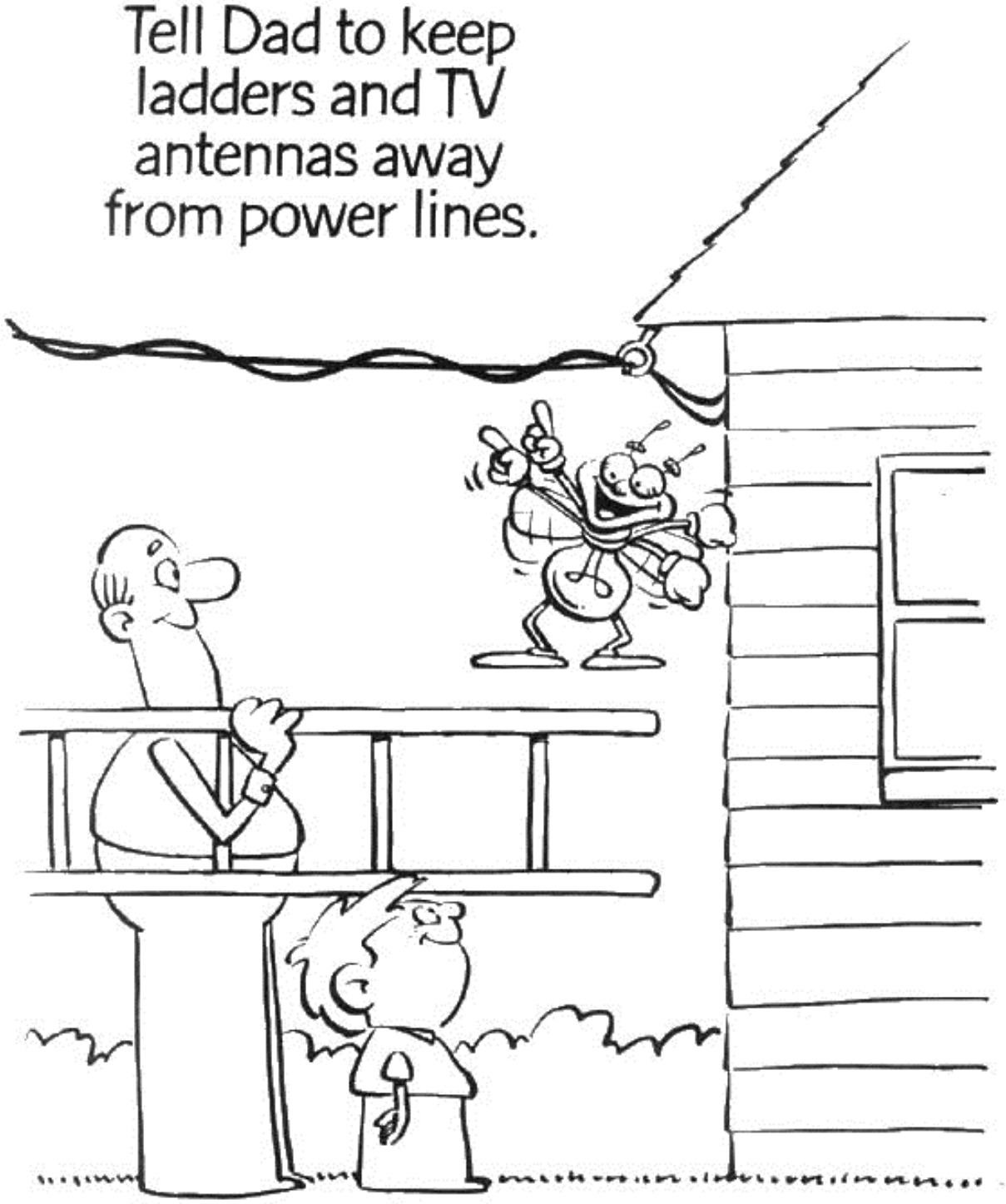

Never overload
outlets with too
many plugs.


NEVER go near
downed power lines
or substations!


Never climb
trees near
power lines.


Never fly
kites near
power lines.


Never use radios
or hair dryers around
baths or showers.


Tell Dad to keep ladders and TV antennas away from power lines.

Louie's Electrical Safety Pledge

I pledge to observe and teach my family and friends the electrical safety rules listed below.

- **Stay away from power lines.**
- **Report downed power lines to police or an adult and keep people away from the line until help arrives.**
- **Don't climb trees near power lines.**
- **Keep radios and hair dryers away from baths and showers.**
- **Unplug cords by pulling on the plug; never pull on the cord.**
- **Keep fingers and objects away from electrical outlets.**
- **Never overload outlets with too many plugs.**
- **Never go near substations; never play on or near transformers.**
- **Never raise ladders near power lines.**
- **Keep balloons and kites away from power lines.**
- **Do not use appliances with frayed or taped cords.**

_____

Your Name

_____

Teacher Name

_____

Parent/ Caregiver Name

Name: _____ Date: _____

Extension Activity:

Energy, how much does it cost?

The energy that is used to light a flashlight is paid for when you buy the batteries. You use energy when you plug something into a socket or turn on a switch. That energy is paid for when your parents get a utility bill. Power from the power company is measured in units of energy called a kilowatt-hour (KwH). A kilowatt is equal to 1000 watts.

Our power bills measure electricity in kilowatt-hours. This is the kilowatts of energy times the number of hours. A kilowatt is 1000 watts.

A kilowatt-hour of energy (kWh) is the amount of energy needed to light ten 100-watt light bulbs for 1hour.

The table below has 5 columns. One column is labeled **Wattage**. The Wattage is the amount of energy each item needs to run. The table also shows the cost to run that item for one hour. This number is in the **Cost** column.

The **Monthly Cost** is what you would pay to run that item every day for one hour for a month (30 days).

Energy Costs Table

Item	Wattage (watts)	Number of Hours	Cost for 1 hour	Monthly cost to run 1 hour every day
Personal Computer	400	1 hour	$0.03	$0.90
Color TV	120	1 hour	$0.01	$0.30
Toaster	1000	1 hour	$0.07	$2.10
Refrigerator	850	1 hour	$0.06	$1.80
Washing Machine	500	1 hour	$0.04	$1.20
Clothes Dryer	2500	1 hour	$0.18	$5.40

This table is based upon a cost of .07 per kilowatt and does not include basic service fees.

Continued on page two ⟶

Name: _____ Date: _____

Energy, how much does it cost? page 2

Answer the following questions. Use the **Energy Costs Table** to help you.
Show any math work on a piece of paper and attach it to this worksheet.

$

1. How much energy does the Personal computer need to run? _____

2. What is the unit used to measure wattage? _____

3. Which item in the table uses the most energy? _____

4. Which item costs the most to run for 1 hour? _____

5. What would be the monthly cost to run the washing machine for 1 hour every day?
_____

6. What would be the monthly cost to run the washing machine for 3 hours every day?
_____

7. Not all household items are used the same number of hours every day. Below is a list of items and the number of hours they are used each day. Calculate the total number of watts used by each item to run for that amount of time. When you are done find the total used by this house in one day.

Item	**Watts**	**Time runs**	**Total Watt-hours for Item**
washing machine	500	2 hours	
dryer	2500	4 hours	
refrigerator	850	24 hours	
color TV	120	7 hours	
personal computer	400	8 hours	
Total Watt-hours for one day =			

Using the number in the box for **Total Watt-hours for one day** calculate the amount used for one week. _____

8. A common light bulb uses 60 watts of energy.

How many light bulbs use the same amount of energy as a color TV? _____

How many light bulbs use the same amount of energy as a refrigerator? _____

Name: _____ Date: _____

Household Energy Use: Reading an Electric Meter

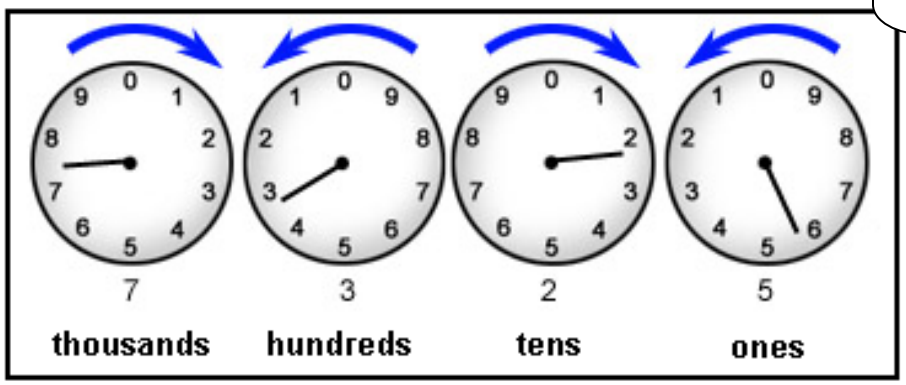
Digital Meter

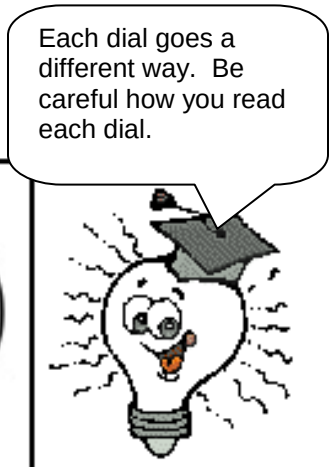
Your home has an electric meter that measures how much energy is used. It is connected to your household circuit. Energy use is measured in kilowatt-hours (kWh).

By reading the meter at the same time each day, you will get an idea of the amount of electricity you used.

By writing each daily reading in an "Energy Diary," you can chart increases and decreases in energy use.

Newer electric meters are digital. You can just read the number. Most electric meters in use today are older and have dials on them. Each dial has a hand that moves. The dials are read from left to right. Look at how the numbers on some dials are different than the numbers on a clock.





This meter reading shows 7,325 kilowatt-hours (kWh).

Rules to remember when reading an electric meter:

- Always read the faces of the meters from left to right
- The first and third dials are read *counterclockwise* and the second and fourth dials are read *clockwise*.
- Each of the dials on a meter form part of one number. The dials from left to the right build a number. The first dial is *thousands, the next is hundreds*, then *tens*, and lastly *ones*.
- If the arm of the dial falls between two numbers, record the smaller number.

Name: _____ Date: _____

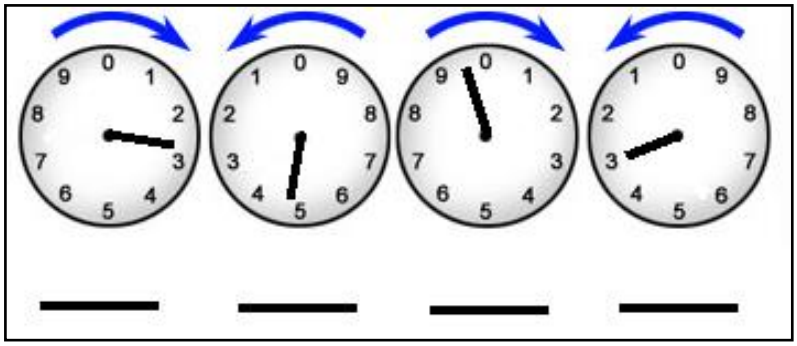
Electric Meter Reading Practice:

Read each meter by writing a number under each dial. Then write the whole number on the line.

Day 1 8:00am

Meter reading:

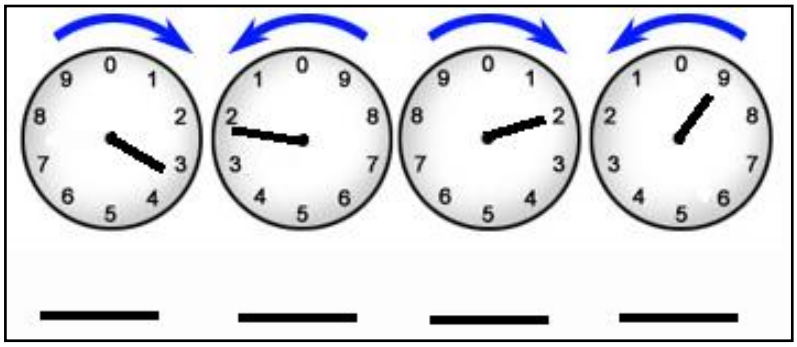
_____



Day 2 8:00am

Meter reading:

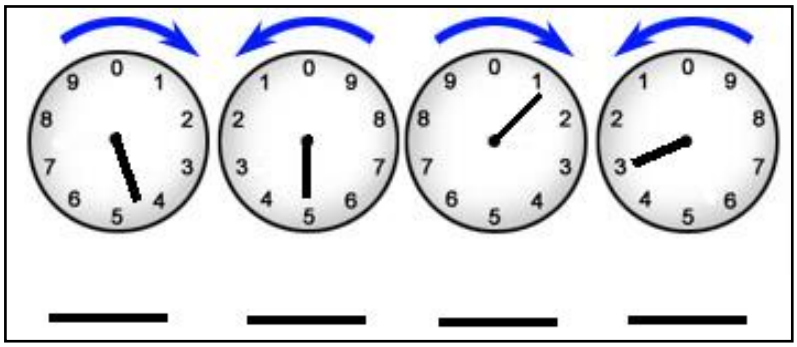
_____



Day 3 8:00am

Meter reading:

_____



You can calculate the amount of energy used each day. Do this by subtracting one day's reading from the next day's reading. For example, if the reading starting a day was 1500 and the next day it was 2000, the total energy used for the day would be 500 kWh. (2000 – 1500 = 500)

Find the amount of energy used for Day 1 and Day 2.

Energy used: Day 1 _____ kWh Day 2 _____kWh

Name: _____ Date: _____

Your Household Energy Use Diary

You can work with your parents to find your home energy use. The best way to do this is to read the electric meter the same time each day.
Make a chart to write down the date, time and meter reading. One has been started for you. Subtract the numbers to get the amount of energy used.

Energy Use Diary (Chart)

If you can, do this for one week. What days of the week are the highest amounts of energy used by your family? What days of the week are the least amounts of energy used? Why do you think there is a difference?

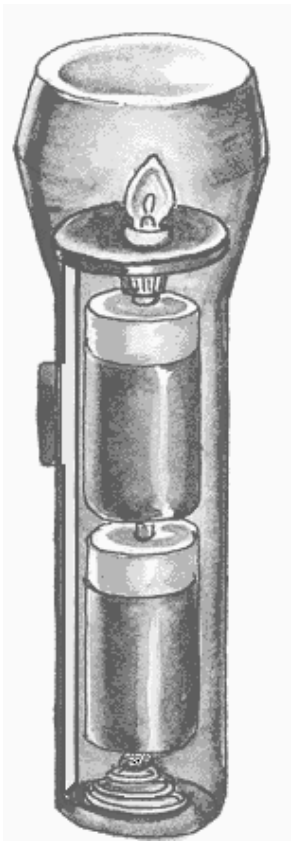
_____

_____

_____

Name: _____ Date: _____

A Flashlight System



System, system what is a system?
A system is a "set of parts."
It is a set of parts that work together.
They work together to do a certain job.

What is the job that a flashlight system does?

A flashlight system changes chemical energy into electrical energy. The electrical energy is changed into light energy in the light bulb. During this energy change heat energy is given off.

Using the flashlight picture and your knowledge of electrical circuits, answer the questions.

1. What is the source of energy? _____

2. What part of the system opens and closes the circuit? _____

3. What two forms of energy are given off by the light bulb? _____
_____ What form of energy is in the battery? _____

4. Is this a series or parallel circuit? _____

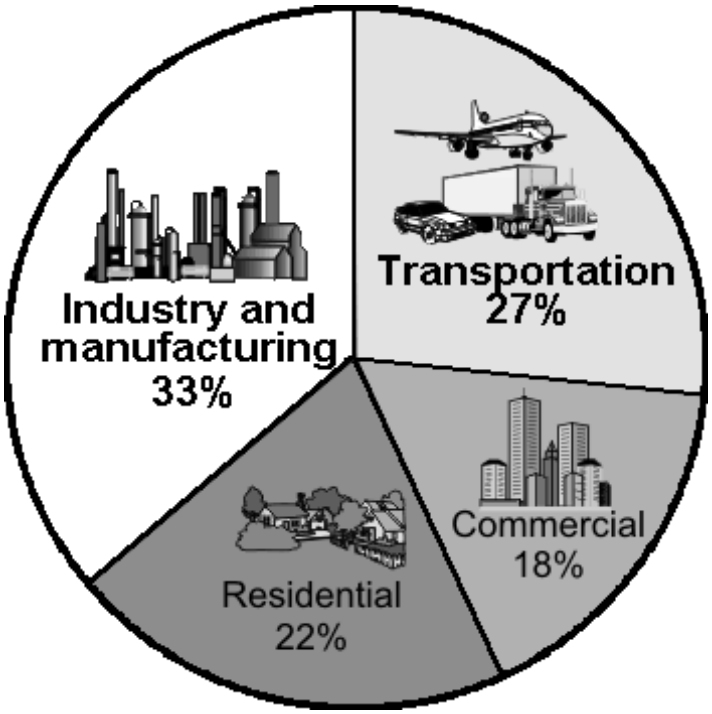
5. What would happen if the light bulb were taken away from the system?
_____

Label these system parts on the diagram: battery, switch, spring, light bulb holder, light bulb, metal strip, case

Name: _____ Date: _____

Energy Use. What do we use energy for in the United States?

The pie chart shows what we use energy for in our nation and how all the energy we use is divided up.
Use the information in the pie chart to complete the table. List the ways we use energy from the largest use to the smallest use.



How we use energy	%
	largest
	smallest

Do any math work for questions 1 – 5 on a separate sheet of paper. Attach the sheet of paper to this page when you are done.

1. The "Industry and Manufacturing" part of the pie is companies that make products to be sold. A farm is industry. The "Commercial" part is businesses that sell products and services. A grocery store is commercial.

How much greater is the percent of energy used for "Industry and Manufacturing" than the percent used for "Commercial"? _____

2. What is the percent total of the 2 largest energy uses? _____

3. What is the least percent of energy used for? _____

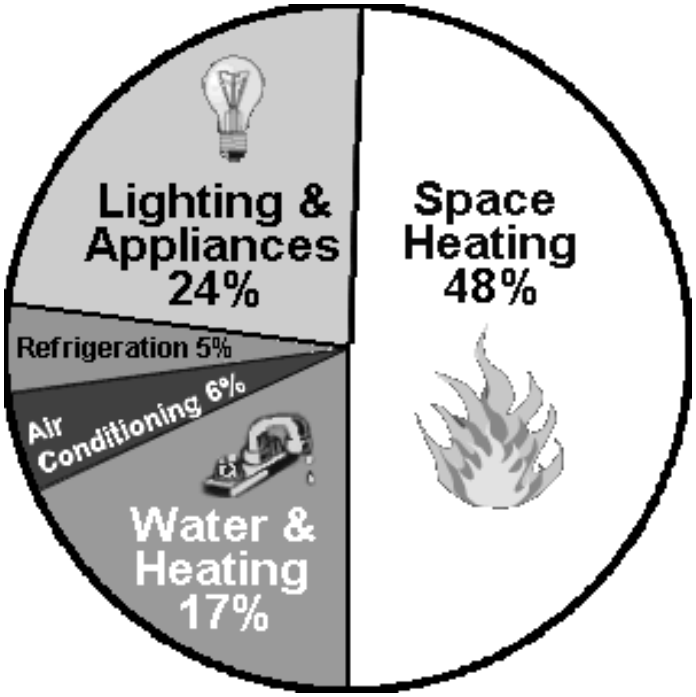
4. What is the total of all of the percents of energy use? _____

Name: _____ Date: _____

Energy Use. What do we use energy for in our homes?

The pie chart shows what we use energy for in our homes and how all the energy we use is divided up.

Use the information in the pie chart to complete the table. List the ways we use energy from the largest use to the smallest use.



How we use energy	%
	largest
	smallest

Do any math work for questions 1 – 5 on a separate sheet of paper. Attach the sheet of paper to this page when you are done.

1. The "Space heating" part of the pie is energy used to heat our homes. The "Water and Heating" part of the pie is energy used to do things such as cooking, drying clothes, blow drying hair, ironing clothes, heating water and getting water to our homes.

How much greater is the percent of energy used for "Space Heating" than the percent used for "Water and Heating"? _____

2. What is the total of the 3 largest energy uses? _____

3. What is the least percent of energy used for? _____

4. What is the total of all of the percents of energy used? _____

5. Think about how you use energy in your home. Write a sentence about what you could do to use less energy.

_____

Name: _____ Date: _____

Electrifying Word Study

1. Circle all of the words with double consonants.

battery	bulb	parallel	circuit	series
copper	socket	insulator	wire	dimmer

2. Write the number of syllables in each word.

___system	___circuit	___positive
___parallel	___insulator	___socket
___series	___electricity	___bulb
___negative	___switch	___conductor

3. Number these words in alphabetical order.

___battery	___insulator	___attract
___positive	___socket	___negative
___bulb	___wire	___fuse
___series	___copper	___parallel

Name: _____ Date: _____

Electrifying MATH

1. There are 4 groups of 6 children each. How many children in all?

_____children

2. If each child needs 2 wires, how many wires will we need for 27 students?

_____wires

3. The groups have: 4 batteries, 3 batteries, 5 batteries and 6 batteries. How may did they have all together?

_____batteries

4. Each group of 4 students is going to have 6 batteries. If there are 7 groups of students how many batteries will be needed?

_____batteries

5. Four children decided to put one bulb in their circuit, 8 decided to put two bulbs. How many more children decided to use two bulbs?

_____more

6. Eighteen children got their bulbs to light. Six children did not. How many more children were successful?

_____children

7. If 25 children each need 32 centimeters of wire, how many centimeters of wire are needed in all?

_____centimeters

How many meters is this? _____meters

Work Space

Name: _____ Date: _____

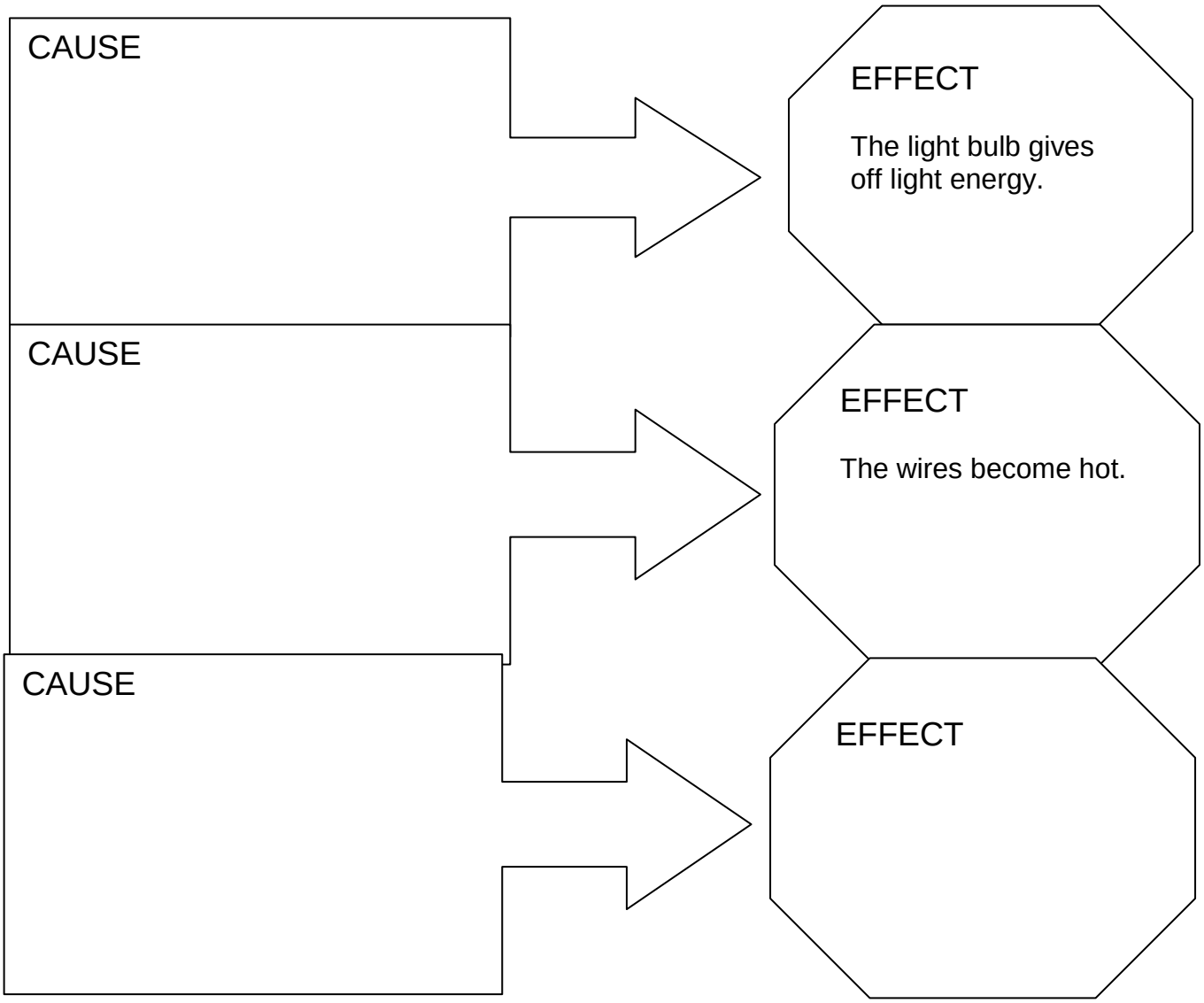
Cause → Effect = Why did it Happen → What Happened

We deal with causes and effects (or effects and causes) every day. We can look at our behaviors and predict what will happen (the effects) from those behaviors, OR we can look at what happened and reflect on the causes.

For example, I know that if I get a flat tire (the cause), I may fall off my bicycle and get hurt (the effect). I may try to avoid that effect by checking my tires before I go for a ride.

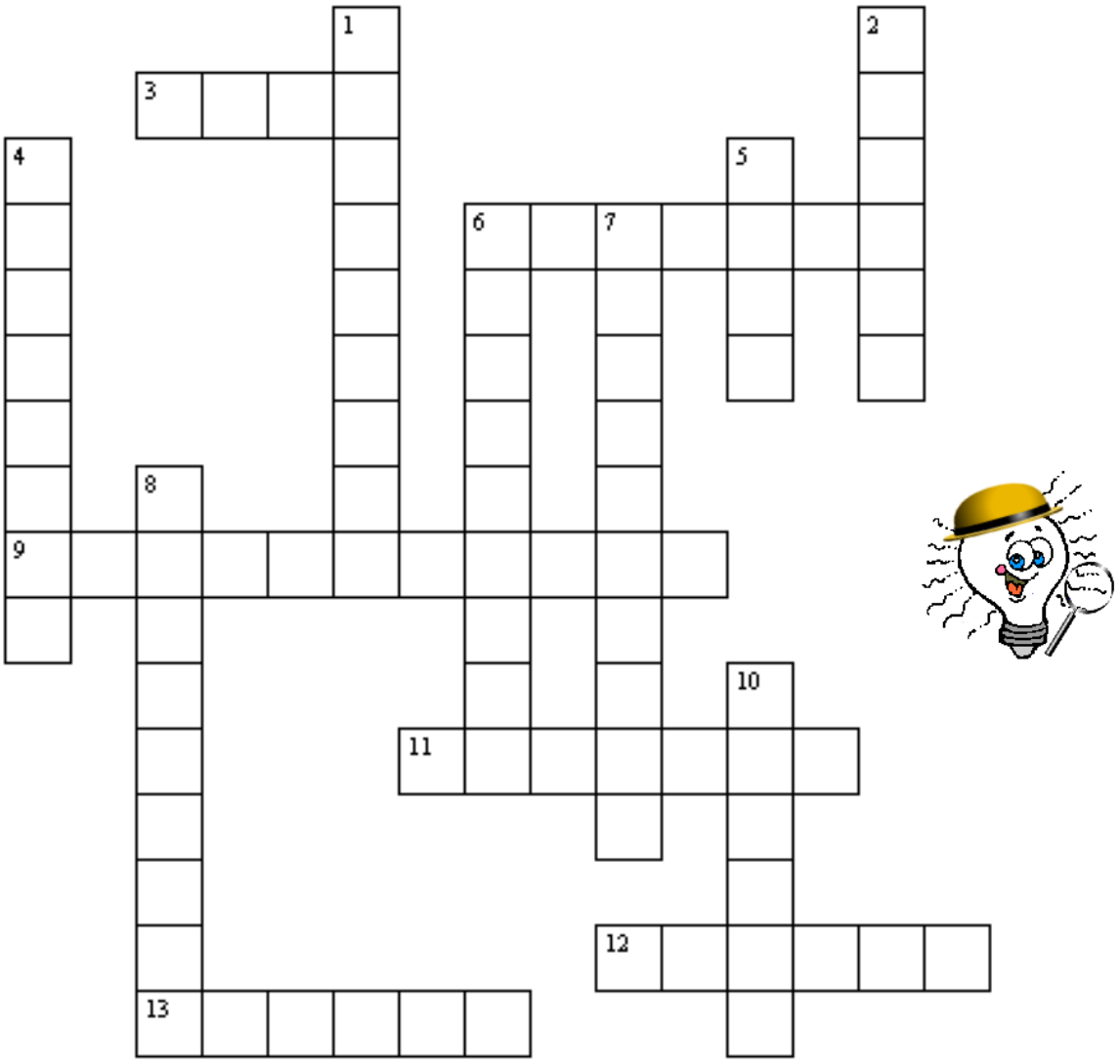
There are many causes and effects to think about with electrical safety. The effect to avoid is getting a shock. A large shock can be very dangerous.

This graphic organizer separates the CAUSE and EFFECT. Your task is to write causes for things that happen in an electric circuit. In the first two boxes, you need to write in a cause for the effect that is given. For the last boxes, you need to write in a different effect of electricity and a cause for that effect.



Name: _____ Date: _____

Electrifying Crosswords



ACROSS

3 A type of circuit that energy will not flow through
6 A system of parts for electricity to flow through
9 Flow of electrons
11 A battery
12 Ability to do work
13 Used to open and close a circuit

DOWN

1 Matter than resists the flow of energy
2 A group of objects that work together to do a job
4 A type of circuit that has more than one path
5 Used for safety to open an overloaded circuit
6 Matter that allows energy to flow through it
7 Opposition to
8 The negative and positive ends of a battery
10 A completed path for electricity to flow