

**Chapter Five, Lesson
Two:**

**Math and
Logic Problems**

**Concepts and Skills
Addressed:**

Arithmetic

Materials Needed:

Paper
Pencil or pen

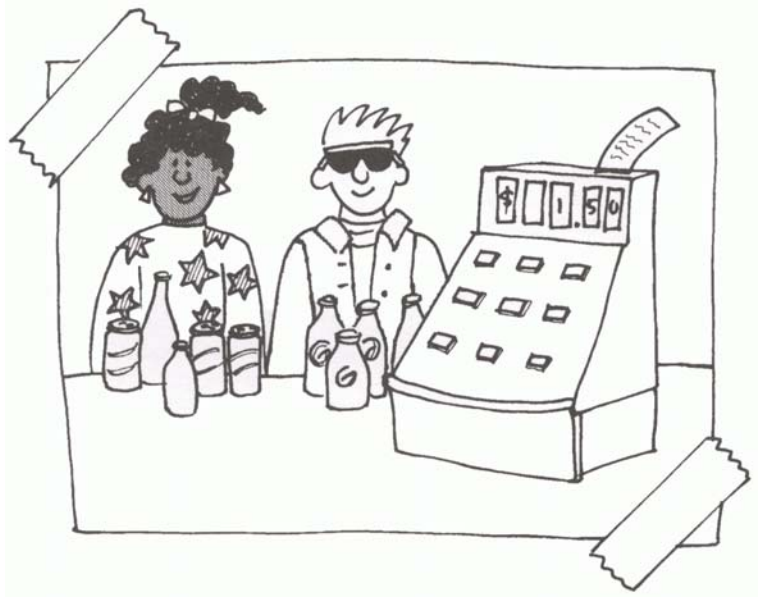
Materials Supplied:

Word Problems

Students will sharpen arithmetic skills while they learn the impact that our choices have on our lives and our environment.

A. Procedure:

1. Divide the class into groups of two.
2. Ask students to read each problem aloud and to work out the answer together.
3. Discuss, then hand in the assignment.



B. The MOBIUS Recycling Center

You have learned that recycling helps us keep useful materials out of the waste stream. But did you know that recycling is a way to earn money? That's right, cans, glass and plastic bottles can be collected and turned in for money. Imagine that MOBIUS operates a recycling center where you receive money for turning in cans and bottles. Based on the chart, answer the following questions:

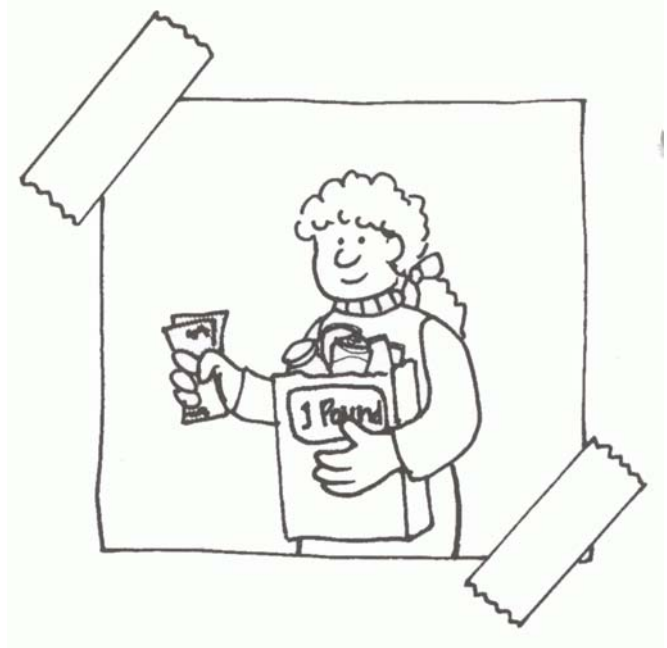


Chart One

<u>Material</u>	<u>Value per pound</u>
Glass	1 cent
Plastic	6 cents
Aluminum	40 cents

1. How much money would MOBIUS pay if you brought him one pound of empty plastic bottles and one pound of aluminum cans?
2. How much money would you earn if you brought MOBIUS one pound of each kind of material?
3. How much money would you earn if you brought MOBIUS two pounds of each material?
4. You collected one pound of aluminum cans and one pound of glass bottles and brought them to the MOBIUS Recycling center. How much money would you earn? If you stopped at the store on the way home, how much more money would you need to buy a drink that cost \$.50?

5. Suppose you knew that you had collected enough glass, plastic bottles, and aluminum cans to earn \$10 at the MOBIUS Recycling Center. You plan to spend this money at a carnival. On the way to turn in the recyclables, you run into a friend and invite him or her to come with you to the recycling center and the carnival, but your friend has no money. So you give your pal 12 pounds of aluminum cans so he or she can get some money from MOBIUS. How much money would your friend be able to spend at the carnival? How much money would you get from MOBIUS after you give away the cans?
6. If you collected enough plastic bottles to equal your weight, how much money would they be worth at the MOBIUS Recycling Center? How about aluminum cans? Glass bottles? (**Note:** If you don't know your weight, assume you weigh 80 pounds).

C. The MOBIUS Beverage Company

NOTE to the teacher: This exercise is designed to show how recycling saves energy in the production processes for all types of materials. As of 1989, U.S. Federal law prohibits the use of recycled plastic in food containers, including those used for beverages. However, recycled plastic is used in toys, to make playground equipment and benches, in carpet fiber, and in many other nonfood applications. Even though this exercise deals with containing a food product, recycled plastic material has been included for the sake of consistency and familiarity.



This exercise demonstrates how recycling saves energy in addition to serving as a possible solution to waste disposal problems.

MOBIUS is going to start his own beverage company. He needs your help to figure out how much energy it takes to put his beverages in containers made of glass, aluminum and plastic. Energy is the amount of power and electricity it takes to make the can and bottles. It is the amount of power and electricity it takes to make the cans and bottles. It is measured in **BTUs**. Once he knows how much energy it takes to make the containers, he can figure out how much to charge for his beverages. Energy costs money; the more energy you save, the more you save and the lower the price MOBIUS will charge. Of course, he'll want to know how much energy it takes to make containers made of recycled ingredients. And he will compare that to the energy needed to make containers out of ingredients that have not been recycled. MOBIUS hopes to find that by using containers made of recycled ingredients he will save energy and money. He also knows that he would be doing his part to reduce the amount of trash thrown away by creating a need for recycled materials.

Chart Two

Type of container	BTUs used		BTUs used per
	per ounce		16 oz. Container
Glass			
All recycled ingredients	164	(164x16)	2,625
No recycled ingredients	383	(383x16)	6,128
Aluminum			
All recycled ingredients	125	(125x16)	2,000
No recycled ingredients	391	(391x16)	6,250
Plastic			
All recycled ingredients	117	(117x16)	1,872
No recycled ingredients	164	(164x25)	2,625

If MOBIUS had his way, his beverage company would use only recycled ingredients for each of these containers. To find out how much energy that would take, he decided to see how many BTUs it took to make 100 containers in each of the three materials. He simply multiplied the number of BTUs per 16 ounce container by 100. Here's what he found:

Chart Three

Type of container	BTUs used for 100 containers of all recycled ingredients	BTUs used for 100 containers of all new ingredients
Glass	262,500	612,800
Aluminum	200,000	625,000
Plastic	187,200	262,500

Unfortunately for MOBIUS, not everyone recycles all of their containers all of the time. In fact, 12 of every 100 glass bottles, or 12%, are recycled, 55 aluminum cans out of 100 are recycled, and 20 out of every 100 plastic bottles are recycled. Help MOBIUS figure out how many actual BTUs are used to make each of these containers based on the above figures and Chart 1.

Glass Equations

1. How many BTUs does it take to make 100 glass bottles if 12 of them are made of only recycled materials and the rest are made of no recycled materials?
2. How many BTUs would it take if 50 of the bottles were made of all recycled materials and 50 were made of no recycled materials?
3. How many BTUs could MOBIUS save for every 100 bottles if people recycled half of their glass bottles, instead of 12 per 100 they are recycling now? HINT: Subtract your answer to question 2 from your answer to question 1.

Aluminum Equations

1. How many BTUs does it take to make 100 aluminum cans if 55 of them are made of recycled materials and the rest are made of all new materials?
2. How many BTUs would it take if 85 of the cans were made from all recycled materials and the rest from no recycled materials?
3. Again, how many BTUs could MOBIUS save if people recycled 85 percent of their aluminum cans?

Plastic Equations

1. How many BTUs does it take to make 100 plastic bottles if 20 of them are made of all recycled materials and the other 80 are made of all new materials?
2. How many BTUs would be used if 50 of the bottles, or 50%, are made of all recycled materials and the rest are made from all new ingredients?
3. How many BTUs would MOBIUS save if this were true?