

# Using the Equal-Arm Balance to Compare Objects

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## Overview and Objectives

In this lesson, students deepen their understanding of the uses of the equal-arm balance as they place a variety of objects in **the** pails and observe and compare the results. This activity provides an opportunity to discuss the idea of fair comparisons. Students will refine and apply the problem-solving strategies they begin to develop in this lesson throughout the rest of the unit. In Lesson 8, for example, they will use the results of their comparisons to place four objects in serial order.

- Students use the equal-arm balance to compare objects.
- Students record comparisons using binary symbols—greater than ( $>$ ), less than ( $<$ ), and equal to ( $=$ ).
- Students discuss their comparisons and problem-solving strategies.
- Students discuss the concept of fair comparisons.

## Background

In this lesson, students begin to compare objects using the equal-arm balance. They discover that if one pail moves down, its contents are heavier than those of the other pail. This reaction also indicates that the contents of the higher pail are lighter than those of the lower pail. If the cross beam remains level with a different object in each pail, those objects are equal. Later in the unit, students will discover that such objects have the same weight.

At this age, students often focus on the heavier of the two objects when making comparisons. For example, they might say only that “the book is heavier than the pencil.” Recognizing that A is heavier than B **and** that B is lighter than A is part of learning how to make comparisons. Although this seems obvious to adults, it may not be initially apparent to your students. Drawing conclusions about lightness or heaviness requires that students not only observe whether the pails move up or down but also understand why they do so.

## Materials

*For every two students*

- 2 copies of **Record Sheet 7-A: Comparing Objects**
- 1 assembled equal-arm balance
- 1 piece of clay
- 6 miscellaneous objects from students’ desks

For the class

2 sheets of newsprint

1 marker

## Preparation

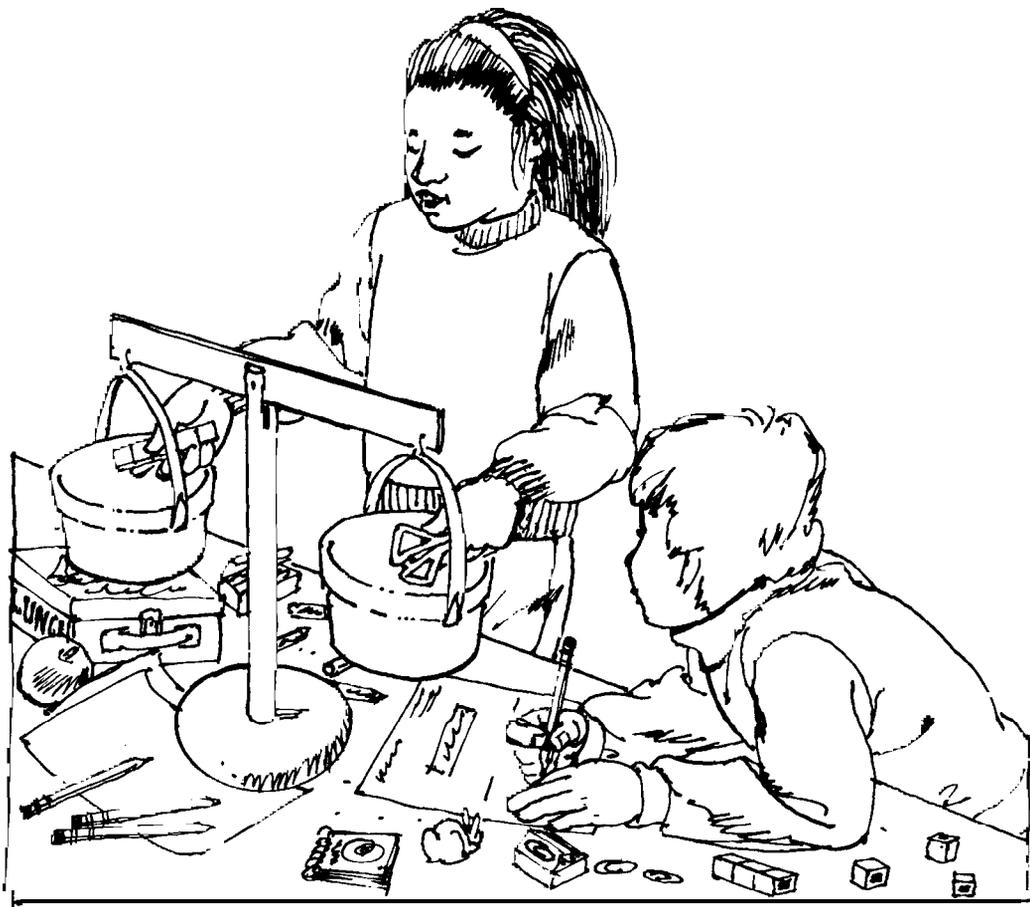
1. Make one copy of **Record Sheet 7-A: Comparing Objects** (pg. 69) for each student.
2. On one sheet of newsprint, write the title “Comparing Objects.”
3. Save the second sheet of newsprint to record students’ comments during Step 1 of the **Final Activities**.

## Procedure

1. Ask students to describe what happened when they placed objects in the pails of the equal-arm balance in Lesson 6.
2. Let them know that today they will use the equal-arm balance to compare objects from their desks. To make their comparisons, students will need to place only one object in each pail at a time, as illustrated in Figure 7-1.

**Figure 7-1**

*Comparing objects with the equal-arm balance and recording results*



3. Distribute a copy of **Record Sheet 7-A: Comparing Objects** to each student. Review the directions on the sheet, pointing out the box that highlights the binary symbols. Let students know that they will use these symbols to record their observations.

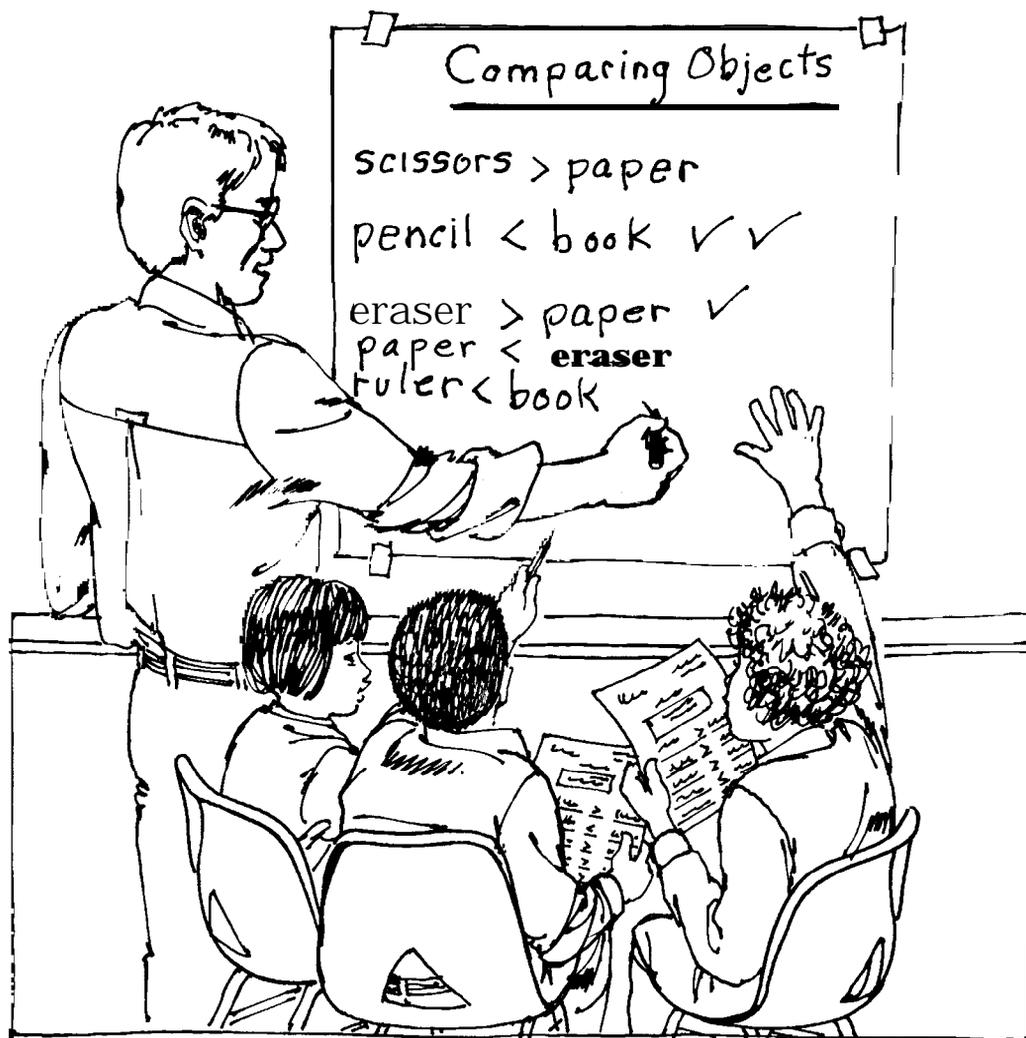
4. Ask students to collect the equal-arm balances and clay. If the beam tilts, have them equilibrate it with clay. Remind the students that they should always level the cross beam before they use the equal-arm balance.
5. Invite each pair of students to select six objects from their desks that they would like to compare. Remind them to compare only two objects at a time and to record their comparisons on the record sheets.
6. After students have completed their comparisons, ask them to return the equal-arm balances to the storage area. Ask them to keep the record sheets at their desks to refer to during the discussion.

## Final Activities

1. Ask each student to select one comparison from the record sheets that he or she would like to share with the class. Use binary symbols to record these comparisons on the chart "Comparing Objects," as illustrated in Figure 7-2. Encourage each student to emphasize the relationship between the two objects by stating his or her comparison in two ways. For example, if the student **first** states that "the eraser > the paper," he or she should then be encouraged to note that "the paper < the eraser."

**Figure 7-2**

*Recording results of student comparisons*



2. Using student observations that you have recorded on the chart as examples, invite students to discuss the following issues:
  - Describe how you decided that \_\_\_\_\_ was lighter **than/heavier** than \_\_\_\_\_
  - Describe what you observed on the equal-arm balance that helped you decide that \_\_\_\_\_ was heavier than/ lighter than \_\_\_\_\_ **Did you** look at the cross beam? The pails?

**Note: Although** your students probably will be eager to describe the exact comparisons they made and what they discovered about the objects, it may be difficult for them to explain the strategies they used to make these comparisons. Encourage them to rephrase **their** comments in a way that clearly describes the process they went through to decide an object was lighter than, heavier than, or equal to another object.

3. Ask students why it was important to level the cross beam before making comparisons. You might want to highlight the following ideas about fair comparisons:
  - If all the equal-arm balances are level at the beginning of the activity, the results of comparisons of two objects will be the same, regardless of which balance you use.
  - If the cross beam of the balance is level, the pails are also level. The pails “start out even,” just like runners who begin a race from the same starting line. As a result, a comparison of two objects will reflect the true difference between them.

## Extensions

### SCIENCE

1. Create a learning center where students can compare additional objects on the equal-arm balance. Students could write task cards for each other to compare various objects, such as “Is the crayon [ $>$ ,  $<$ , or  $=$ ] the pencil?”

### SCIENCE

2. In a learning center, provide challenges for students to solve, such as “How could you use the equal-arm balance to equally share a box of raisins with one person? With three people?”

### MATHEMATICS

3. Have students create number sentences to help them connect their use of binary symbols in this lesson to their studies in mathematics. For example, have students determine whether the “greater than” or “less **than**” symbol should be used in number sentences, such as “7 is ( $<$  or  $>$ )  $2 + 3$ .”

### LANGUAGE ARTS

4. Have students write in their science journals. Ask them to list words that are used to compare objects, such as “heavier than,” “bigger than,” and “wider than.” Or ask them to list synonyms for “heavy” and “light.”

### LANGUAGE ARTS

5. Invite students to write a riddle using descriptive words that compare size and weight. Here is an example of a problem-solving riddle.

“I am smaller than a lunch box. I am bigger than a crayon. I am lighter than a book. I am heavier than a sheet of paper. I keep your fingers from getting cold in the snow. What am I?”

## Record Sheet 7-A

Name: \_\_\_\_\_  
\_\_\_\_\_Date: \_\_\_\_\_  
\_\_\_\_\_

## Comparing Objects

<p>&gt; Heavier than &lt; Lighter than = Equal to</p>
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On each line, write the names of the objects you compared.  
Write one **symbol** that shows the comparison.

1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ ( > , < , = )

2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ ( > , < , = )

3. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ ( > , < , = )

4. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ ( > , < , = )