ACTIVITY 4

Mass

BROWARD COUNTY ELEMENTARY SCIENCE BENCHMARK PLAN

Grade 1—Quarter 1
Activity 4

SC.A.1.1.1
The student knows that objects can be described, classified, and compared by their composition (e.g., wood or metal) and their physical properties (e.g., color, size, and shape).

SC.H.1.1.1
The student knows that in order to learn, it is important to observe the same things often and compare them.

SC.H.1.1.2
The student knows that when tests are repeated under the same conditions, similar results are usually obtained.

SC.H.1.1.3
The student knows that in doing science, it is often helpful to work with a team and to share findings with others.

SC.H.1.1.5
The student uses the senses, tools, and instruments to obtain information from his or her surroundings.

SC.H.3.1.1
The student knows that scientists and technologists use a variety of tools (e.g., thermometers, magnifiers, rulers, and scales) to obtain information in more detail and to make work easier.

ACTIVITY ASSESSMENT OPPORTUNITIES

The following suggestions are intended to help you identify major concepts covered in the activity that may need extra reinforcement. The goal is to provide opportunities to assess student progress without creating the need for a separate, formal assessment session (or activity) for each of the 40 hands-on activities at this grade level.

1. Display unopened containers of common food items, such as cereal boxes, cans of vegetables and fruit, boxes of pasta, and so on. First have students use only their sense of sight to guess which container is the heaviest (has the most mass) and which is the lightest (has the least mass). Then ask students to order the containers from least to most mass (not size) after picking them up. Encourage them to also look at the metric units of mass (grams) labeled on the containers as they put them in order. Consider using three or four cans or boxes that have the same mass but are different sizes. Help students differentiate between size and mass.

2. Use the Activity Sheet(s) to assess student understanding of the major concepts in the activity.

In addition to the above assessment suggestions, the questions in bold and tasks that students perform throughout the activity provide opportunities to identify areas that may require additional review before proceeding further with the activity.

ACTIVITY 4

Mass

OBJECTIVES

Students compare the relative masses of different objects using an equal-arm balance.

The students

- predict the relative masses of different objects
- use an equal-arm balance to determine the relative masses of the objects
- arrange the objects in order of increasing relative mass

SCHEDULE

About 40 minutes

VOCABULARY

equal-arm balance
mass

MATERIALS

For each student

1	Activity Sheet 4

For each team of four

1	balance, equal-arm
1	block, square, any color
1	candle, birthday
1	cork
1	feather
1	shell
1	spoon, plastic
1	tray, sorting

For the class

1	crayon
1 pair	scissors*
	Delta Science Reader, *Properties*

*provided by the teacher

PREPARATION

1. Make a copy of Activity Sheet 4 for each student.
2. Put the following items together on a sorting tray for each team of four: a square block, a birthday candle, a cork, a feather, a shell, and a plastic spoon.
3. Each team of four will need an equal-arm balance (consisting of an arm and a pivot) and their sorting tray of items.
4. You will need a crayon and a pair of scissors for an opening discussion.

BACKGROUND INFORMATION

Mass is a measure of the amount of material in any object. The more mass an object has, the more it resists changes in its motion. Thus it is harder to start a boulder moving or to stop a moving boulder than it is a pebble.

Weight is a measure of the gravitational force acting on an object. The greater an object's mass, the greater the gravitational force acting on it, and the greater its weight will be. Thus more-massive objects weigh more than less-massive objects.

An object's mass remains the same no matter where the object is. Weight, however, varies with the gravitational pull on the object. For example, an astronaut's weight on the moon

is less than his or her weight on Earth, but the astronaut's mass is the same on the moon and Earth.

An ***equal-arm balance*** is an instrument for measuring mass that consists of a beam supported in the center with two trays or pans of equal mass at either end. In this activity, students use an equal-arm balance to compare the relative masses of different objects. First, they hold various objects to gain an intuitive understanding of the expressions ***more mass*** and ***less mass.*** Students then place objects on opposite sides of the balance and observe that the side with the "more mass" object goes down while the side with the "less mass" object goes up. Students use the balance to arrange the objects by increasing relative mass.

Arranging objects in seriate order is another way of sorting and organizing the objects in our environment. Students practice arranging objects in seriate order when they stack together a set of nesting boxes or arrange family members in order of increasing height.

▼ **Activity Sheet 4**

Mass

1. Draw a picture of the object on your tray with the most mass.

a shell

2. Draw a picture of the object on your tray with the least mass.

a feather

3. Draw a picture on the line below of each of the objects you measured. Draw them along the line from least mass to most mass.

feather/plastic spoon/birthday candle/cork/square block/shell

Least mass — Most mass

Guiding the Activity

Additional Information

1

Write the word *mass* on the board and tell students that **mass** is a measure of how much matter is in an object.

Hold up a pair of scissors and a crayon. Say, **Raise your hand if you think the scissors have more mass than the crayon.** Then, **Raise your hand if you think the crayon has more mass than the scissors.**

Record students' guesses on the board.

Ask, **How can you tell which of these two objects has more mass than the other?**

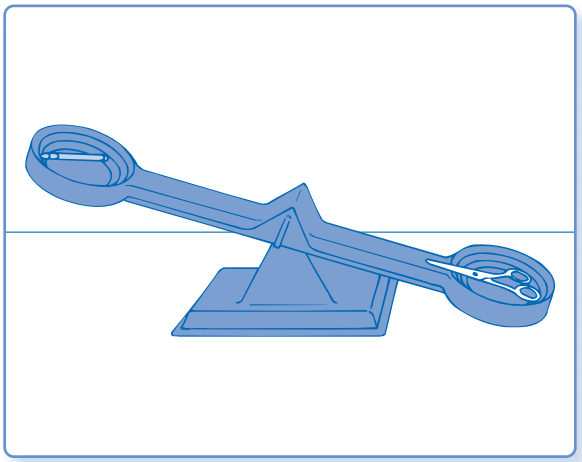
Students might say that they would need to hold one in each hand to compare them. Some students might suggest weighing the two objects.

Invite two student volunteers to each take a turn picking up the two objects and comparing their masses. Ask, **Which feels like it has more mass, the scissors or the crayon?**

Accept each student volunteer's response and record it on the board. The two answers might or might not be the same.

2

Tell students that they are going to find out which of the two objects has more mass by using a special measuring device. Write *equal-arm balance* on the board. Point to an equal-arm balance and explain that an **equal-arm balance** is a tool that scientists use to determine which of two objects has more mass (see Figure 4-1).



▲ ***Figure 4-1.*** *An equal-arm balance can be used to determine which of two objects has more mass.*

Demonstrate the use of the balance: Place the scissors in one pan and the crayon in the other pan. Ask, **What happened to the pans? What do you think that means?**

Students should say that the pan with the scissors went down while the pan with the crayon went up. Students might realize that the pan with the scissors went down because the scissors have more mass than the crayon.

Guiding the Activity

Guiding the Activity	Additional Information
Compare the masses of other objects in the classroom until students understand that the object with more mass always makes the pan go down.	
3 Distribute an equal-arm balance and a sorting tray of objects to each team of four and a copy of **Activity Sheet 4** to each student. Have students compare the relative masses of the different objects using the equal-arm balance and determine which object has the most mass and which has the least mass. Students should record their results on their activity sheets.	*Students might need guidance with this exercise. Point out that they must compare the masses of only two objects at a time until they have determined which object has the most mass and which has the least mass of the group. For example, to determine which object has the most mass, they should first place two objects on the balance—one in each pan. The object whose pan goes up should then be removed and replaced by the next object in the group. Students should continue this way until they have determined which object made the pan go down in all trials.*
After all the groups have finished comparing the masses of all their objects, stimulate class discussion. Ask, **Which of the objects has the most mass? Which has the least mass?**	*Students should say that the shell has the most mass while the feather has the least mass.*
4 Next, encourage students to arrange their objects from least mass to most mass.	*Students should have figured out which object has the most mass and which has the least mass, but might need assistance figuring out the order of the objects in between. If necessary, point out to them that each object must be tested against each other object in order to determine the relative mass of each object. Encourage them to retest pairs of objects as needed to determine the correct ordering of objects.*
Students should draw a picture of each object along the line in question 3 of their activity sheets, ordering the objects from least mass to most mass. Go over student responses once they have finished.	*Help students read the instructions on their activity sheets.*
5 As appropriate, read or review page 6 of the Delta Science Reader *Properties*.	

Reinforcement

If students have difficulty understanding how to arrange objects in seriate order, have three students of different heights stand up. Then have the students arrange themselves from shortest to tallest.

Science Journals

Have students place their completed activity sheets in their science journals.

Cleanup

Have students return the sorting trays, equal-arm balances, birthday candles, corks, feathers, shells, and plastic spoons to the kit. Return the square blocks to their correct packages.

Connections

Science and the Arts

Hang a simple mobile in the classroom for students to observe. Point out that the suspended objects are arranged so they balance one another, like the pans on the equal-arm balance they used. Suggest that students create their own mobiles by suspending objects with string from a plastic or metal coat hanger. Provide a rich variety of objects for students to choose from—shells, hardware items such as screws and bolts, small figurines, beads, sheets of colored plastic that can be cut into different shapes, and so forth. Also provide some short wooden dowels or heavyweight drinking straws so students can incorporate additional balanced levers suspended from the coat hanger. Let students work out the balancing tasks on their own as much as possible, but if needed, show them how to increase or decrease the length of a lever arm or increase the mass of an object slightly with a bit of clay to achieve balance. Display the completed mobiles in the classroom before students take them home.

Science and Math

As an introduction to the concept of using standard units to measure mass, have each team use an equal-arm balance to determine the masses of various objects in units of paper clips. Demonstrate the procedure with a new crayon: put the crayon in one pan of the balance, add paper clips to the other pan until the two pans balance, and count the paper clips. Let each team try this with an identical new crayon to see whether all teams arrive at the same mass. Draw a two-column table on the board, with the first column labeled *Object* and the second column labeled *Mass in Paper Clips,* and enter the information for the crayon. Repeat the measuring and recording procedure with other uniform objects, such as a new pencil, a new eraser, and a crumpled sheet of paper. (With older or more capable students, have each team draw its own table, using the one you drew as a model, and record the name and mass of each object.)

In a follow-up class discussion, have teams compare their results for each object. (If any team's mass for an object is markedly different from the mass reported by other teams, have the team re-balance the object and recount the paper clips.) Finally, have students sequence the objects from least mass to most mass.

Science Challenge

As a follow-up to the Science and Math connection above, ask students to explain why using paper clips to measure the masses of objects is "better" than just using their hands to feel which objects have more mass than others. Students should be able to express, in simple terms, that using a unit of measurement lets them know how much mass an object has, not just whether it has more or less mass than another object. Using paper clips also allowed them to determine mass differences that were too small to perceive with their hands.